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# AN IMPLICIT METHOD FOR THREE-DIMENSIONAL VISCOUS FLOW WITH APPLICATION TO CONES AT ANGLE OF ATTACK

William S. Helliwell, et al

Aerospace Corporation

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A description of the associated computer program is contained in the appendices.



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## FOREWORD

This report is published by The Aerospace Corporation, El Segundo, California, under Air Force Contract No. F04701-73-C-0074. This report was prepared by the Information Processing Division, Engineering Science Operations, at the request of the Reentry Systems Division, Development Operations.

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Publication of this report does not constitute Air Force approval of the report's findings or conclusions. It is published only for the exchange and stimulation of ideas.

A. C. Klingler, Captain, USAF
Project Officer, RSSE

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## ABSTRACT

An iteration method for solving the implicit difference equations associated with three-dimensional nonlinear parabolic differential equations is derived and analyzed. The method is applied to the high Reynolds number laminar viscous flow around a cone at high angle of attack. The requirements which must be met to ensure convergence of the iterations are obtained. In addition, an analysis of the stability of the difference equations is presented and discussed. The numerical results are compared with experimental data for a 10-deg cone at 12-deg angle of attack, and a 5.6-deg cone at 8-deg angle of attack. The agreement is very good.

A description of the associated computer program is contained in the appendices.


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## SYMBOLS

| | |
|---|---|
| $h$ | static enthalpy ($h = \tilde{h}/\tilde{h}_\infty$) |
| $j, k, \ell$ | finite-difference grid points in $x, y, \Phi$ directions, respectively |
| $K, L$ | number of mesh points in $y$ and $\Phi$ directions, respectively |
| $\mathscr{L}$ | length used to nondimensionalize variables |
| $M_\infty$ | free stream Mach number |
| $M_x$ | local streamwise Mach number ($M_x = uM_\infty/\sqrt{h}$) |
| $p$ | dimensionless pressure ($p = \tilde{p}/\tilde{\rho}_\infty \tilde{V}_\infty^2$) |
| $Pr$ | freestream Prandtl number (assumed constant) |
| $r$ | distance from a point in the flow to the axis of symmetry of the cone ($r = x \sin\theta + y \cos\theta$) |
| $Re$ | free stream Reynolds number $\left(Re = \dfrac{\tilde{\rho}_\infty \tilde{V}_\infty \mathscr{L}}{\tilde{\mu}_\infty}\right)$ |
| $S$ | Sutherland constant |
| $u, v, w$ | dimensionless velocity components in $x, y, \Phi$ directions, respectively ($u = \tilde{u}/\tilde{V}_\infty$, $v = \tilde{v}/\tilde{V}_\infty$, $w = \tilde{w}/\tilde{V}_\infty$) |
| $V_\infty$ | free stream velocity ($V_\infty = \tilde{V}_\infty/\tilde{V}_\infty = 1$) |
| $x, y, \Phi$ | coordinates along the cone, normal to the cone, around the cone, respectively ($x = \tilde{x}/\mathscr{L}$, $y = \tilde{y}/\mathscr{L}$) |
| $\alpha$ | angle of attack |
| $\gamma$ | ratio of specific heats (assumed constant) |
| $\Delta x, \Delta y, \Delta\Phi$ | mesh spacing in $x, y, \Phi$ directions, respectively |
| $\eta$ | transformed normal coordinate ($\eta = y/\xi$) |
| $\theta$ | cone half angle |
| $\mu$ | viscosity [$\mu = \sqrt{h}\,(1+S)/(1+S/h)$] |

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SYMBOLS (Continued)

| | |
|---|---|
| $\xi$ | distance from shock to cone surface |
| $\rho$ | density ($\rho = \gamma M_\infty^2 \, p/h$) |

Subscripts

| | |
|---|---|
| $\infty$ | denotes free stream conditions |
| w | denotes conditions at the cone |

Superscripts

| | |
|---|---|
| ~ | denotes dimensional quantity |
| n | denotes iteration number |

## SECTION I

## INTRODUCTION

In recent years there has been a tremendous increase in numerical solutions for three-dimensional flow problems. This increase has been due to the rapid growth in the storage capacity and speed of computers. The primary effort in computing three-dimensional flows has been in using explicit methods. Explicit methods, although relatively easy to program, consume excessive amounts of computer time due to stability restrictions on step sizes. Even a DuFort-Frankel (Ref. 1) or Crocco (Ref. 2) scheme uses a considerable amount of time when the mesh spacing is small, as is necessary for accuracy with high speed, high Reynolds number laminar flow problems. Therefore, for many flow problems it is desirable to use an implicit technique to solve the governing partial differential equations. Implicit methods have the advantage of being stable, consistent, and accurate for reasonable stepsizes. The major drawback is the size and complexity of the computer program which must be written and the storage requirements due to the necessity of solving large systems of equations. Alternating direction implicit methods (Ref. 3), although reducing the size of the system of equations which must be solved for three-dimensional problems, double the complexity of the computer code which must be developed.

In this report, a method of solving the large system of algebraic equations which result from the implicit differencing of three-dimensional flow equations is developed. For a typical problem, the implicit differencing may result in a system of 6000 or more algebraic equations. A method of solving these equations which does not require excessive computer storage and that yields accurate results is presented. The method is similar to the "predictor corrector" multiple iteration technique described by Rubin and Lin (Ref 4).

The numerical approach begins with an implicit differencing of the system of nonlinear partial differential equations. The nonlinear algebraic

equations resulting from this differencing are first linearized, and the resulting linear algebraic equations are then solved using a Gauss-Seidel (Ref. 5) iteration method. The details of the method are given in Section II for a simple model equation. Because of the necessity of iterating, which results from the numerical approach, the convergence of the iteration should be considered. This question is also analyzed in Section II for the model equation.

In Section III, the numerical technique which is developed is applied to the solution of an approximate system of three-dimensional equations which has been developed to predict the flow fields around cones at high angles of attack. This approximate system of viscous equations has been derived from the steady Navier-Stokes equations by assuming the gradients of the shear stress in the streamwise direction are much smaller than the gradients in the normal and circumferential directions (Ref. 6). The resulting equations are similar to those developed by Lin and Rubin (Ref. 7) to solve the sharp tip, low Reynolds number region for a cone at angle of attack. The resulting system of equations is first order in x and second order in y and $\phi$. The convergence and stability of the system of equations are discussed.

Solutions to the system of equations are presented for two cases in Section IV. The first, a 10-deg half angle cone at 12-deg angle of attack and a freestream Mach number of 8; and the second, a 5.6-deg half angle cone at 8-deg angle of attack and a freestream Mach number of 14.2. The conditions for these cases correspond closely to experimental data obtained by Tracy (Ref. 8) and Stetson and Ojdana (Ref. 9). Comparisons of the numerical results with the experimental data are shown.

## SECTION II

## NUMERICAL TECHNIQUE

In this section, the numerical technique is developed and analyzed. To illustrate the approach, the following three-dimensional partial differential equation is considered:

$$\frac{\partial u}{\partial x} + a\frac{\partial u}{\partial \eta} + b\frac{\partial u}{\partial \Phi} - c\frac{\partial^2 u}{\partial \eta^2} - d\frac{\partial^2 u}{\partial \Phi^2} = 0 \qquad c,\ d \geq 0 \tag{1}$$

This equation is representative of the viscous flow equation. For three-dimensional steady flow, $a = v/u$, $b = w/ur$, $c = \mu/Re\rho u$, $d = \mu/Re\rho ur^2$.

The following finite difference approximation formulas are used:

$$\frac{\partial u}{\partial x} = (u_{j+1,k,\ell} - u_{j,k,\ell})/\Delta x$$

$$\frac{\partial u}{\partial \eta} = (u_{j+1,k+1,\ell} - u_{j+1,k-1,\ell})/2\Delta\eta$$

$$\frac{\partial^2 u}{\partial \eta^2} = (u_{j+1,k+1,\ell} - 2u_{j+1,k,\ell} + u_{j+1,k-1,\ell})/\Delta\eta^2 \tag{2}$$

$$\frac{\partial u}{\partial \Phi} = (u_{j+1,k,\ell+1} - u_{j+1,k,\ell-1})/2\Delta\Phi$$

$$\frac{\partial^2 u}{\partial \Phi^2} = (u_{j+1,k,\ell+1} - 2u_{j+1,k,\ell} + u_{j+1,k,\ell-1})/\Delta\Phi^2$$

where $u_{j,k,\ell}$ is the value of u at the grid point $j,k,\ell$.

In addition, in the more general case, a cross derivative term appears. For completeness the difference formula is defined.

$$\frac{\partial^2 u}{\partial\eta\partial\Phi} = [(u_{j+1,k+1,\ell+1} - u_{j+1,k-1,\ell+1}) - (u_{j+1,k+1,\ell-1} - u_{j+1,k-1,\ell-1})]/4\Delta\eta\Delta\Phi \qquad (3)$$

The scheme for solving the differential equation is then completely implicit. To obtain $u_{j+1,k,\ell}$ (solution known at j) a linear system of equations of order K * L must be solved.

The method proposed to solve this system of linear equations is the line Gauss-Seidel iteration method mentioned in Fox (Ref. 5) and Isaacson and Keller (Ref. 10). To be specific, suppose $u^n_{j+1,k,\ell}$ is a guess to the solution of the difference equations where n denotes the iteration number. Then the correction $\bar{u}_{j+1,k,\ell}$ which must be added to $u^n_{j+1,k,\ell}$ to give the solution satisfies, after rearranging

$$\left(-\frac{a}{2\Delta\eta} - \frac{c}{\Delta\eta^2}\right)\bar{u}_{j+1,k-1,\ell} + \left(\frac{1}{\Delta x} + \frac{2c}{\Delta\eta^2} + \frac{2d}{\Delta\Phi^2}\right)\bar{u}_{j+1,k,\ell} + \left(\frac{a}{2\Delta\eta} - \frac{c}{\Delta\eta^2}\right)\bar{u}_{j+1,k+1,\ell}$$

$$= -\frac{\partial u^n}{\partial x} - a\frac{\partial u^n}{\partial\eta} - b\frac{\partial u^n}{\partial\Phi} + c\frac{\partial^2 u^n}{\partial\eta^2} + d\frac{\partial^2 u^n}{\partial\Phi^2} - \frac{b}{2\Delta\Phi}\left(\underline{\bar{u}_{j+1,k,\ell+1}} - u_{j+1,k,\ell-1}\right)$$

$$+ \frac{d}{\Delta\Phi^2}\left(\underline{\bar{u}_{j+1,k,\ell+1}} + \bar{u}_{j+1,k,\ell-1}\right) \qquad (4)$$

If the underlined terms on the right hand side of Eq. (4) are ignored and the resulting equations are solved in the order $\ell = 1, 2, \ldots L$, using the boundary conditions at $\ell = 1$, then the approximate solution denoted by $\bar{U}_{j+1,k,\ell}$ should be close to $\bar{u}_{j+1,k,\ell}$. Taking $u^{n+1}_{j+1,k,\ell} = u^n_{j+1,k,\ell} + \bar{U}_{j+1,k,\ell}$ as a new guess to the solution of Eq. (1) the process is repeated to obtain $u^{n+2}_{j+1,k,\ell}$ and so on until convergence is achieved.

The above method has the advantage that L systems of order K must be solved instead of one of order L * K. This saves time and storage.

A seeming disadvantage is that iteration is required. That is, solving L systems of order K just produces a "guess" to the solution of Eq. (4). To obtain a better "guess" the L systems have to be solved again, etc.

However for nonlinear problems this is not a disadvantage. To solve a nonlinear system of equations, some form of linearization must be done (e.g., Newton-Raphson method) and then iteration is done to obtain an accurate solution. The line Gauss-Seidel method may be used to solve the linear system, and instead of iterating to convergence the first iterate is taken as the next iterate in the nonlinear sequence of iterates. Experience has shown that the convergence of the nonlinear iterates is not severely hindered by not solving exactly for the iterate.

Once the iterations have converged then the method is completely implicit and so the single linear Eq. (1) is stable and consistent. The primary question to be answered is whether or not the iterates converge. To consider the convergence question write the difference equation [Eq. (4)] as

$$u^{n+1}_{j+1,k,\ell} + \frac{c\Delta x}{2\Delta\eta}\left(u^{n+1}_{j+1,k+1,\ell} - u^{n+1}_{j+1,k-1,\ell}\right) + \frac{b\Delta x}{2\Delta\Phi}\left(u^{n}_{j+1,k,\ell+1} - u^{n+1}_{j+1,k,\ell-1}\right)$$
$$- \frac{c\Delta x}{\Delta\eta^2}\left(u^{n+1}_{j+1,k+1,\ell} - 2u^{n+1}_{j+1,k,\ell} + u^{n+1}_{j+1,k-1,\ell}\right)$$
$$- \frac{d\Delta x}{\Delta\Phi^2}\left(u^{n}_{j+1,k,\ell+1} - 2u^{n+1}_{j+1,k,\ell} + u^{n+1}_{j+1,k,\ell-1}\right) = u_{j,k,\ell} \qquad (5)$$

The above equation is a difference equation with difference index n. To determine under what conditions the solution converges as $n \to \infty$ the Fourier series method as presented in Richtmyer and Morton (Ref. 11) may be used. That is, substitute $\lambda e^{i(m_1\ell\Delta\Phi + m_2 k\Delta\eta)}$ for $u^{n+1}_{j+1,k,\ell}$ and $e^{i(m_1\ell\Delta\Phi + m_2 k\Delta\eta)}$ for $u^{n}_{j+1,k,\ell}$. The term $u_{j,k,\ell}$ is ignored since it is independent of n, and

the resulting equation is solved for $\lambda$. The iterates will converge if $|\lambda| < 1$. For Eq. (5) the amplification factor $\lambda$ is

$$\lambda = \frac{-\left(\frac{b\Delta x}{2\Delta\Phi} - \frac{d\Delta x}{\Delta\Phi^2}\right)(\cos m_1\Delta\Phi + i\sin m_1\Delta\Phi)}{1 - \left(\frac{b\Delta x}{2\Delta\Phi} + \frac{d\Delta x}{\Delta\Phi^2}\right)\cos m_1\Delta\Phi - \frac{c\Delta x}{\Delta\eta^2}(\cos m_2\Delta\eta - 1) + \frac{2d\Delta x}{\Delta\Phi^2} + \frac{a\Delta x}{\Delta\eta} i\sin m_2\Delta\eta + \left(\frac{b\Delta x}{2\Delta\Phi} + \frac{d\Delta x}{\Delta\Phi^2}\right) i\sin m_1\Delta\Phi} \tag{6}$$

After some manipulation it can be shown that $|\lambda| < 1$ if $\Delta x < \frac{\Delta\Phi}{|b|}$.

If the values of u at $\ell - 1$ were evaluated at the $n^{th}$ iterate instead of the $n+1^{th}$, this would be the line Jacobi elimination method (Ref. 10) and the convergence criterion would be the same. It is line Jacobi elimination that Rubin and Lin (Ref. 4) studied; however, instead of considering convergence they looked at what would happen if just one or two iterations were carried out. They found that the equations were not quite consistent and for the method to be stable as a marching scheme in x there was a restriction on $\Delta x$ depending on the number of iterations performed. For one iteration, the stability restriction was the same as the above derived convergence restriction. (Rubin and Lin considered the case where $c = 0$.) The question may be asked why it is necessary to iterate to convergence (which may require four or five iterations) instead of iterating only once or twice. Iterating to convergence produces consistency, and in nonlinear equations it is necessary to iterate several times to obtain an accurate and stable solution to the nonlinear difference equations.

The rates of convergence for the line Jacobi method and the line Gauss-Seidel method have been studied for elliptic problems (Ref. 10) and it has been found that the line Gauss-Seidel method converges twice as fast as the line Jacobi method. The results for the above simple parabolic case are analogous.

If a DuFort-Frankel scheme or a Crocco scheme or some other modified explicit formula (modified to remove the diffusive stability requirement)

is used, there are two convective stability requirements. The above scheme eliminates one convective $\Delta x$ restriction. For problems which permit very unequal meshes in the two directions, as for many flow problems, this may permit much greater step sizes.

In the next section, the differencing described above is applied to a complicated system of three-dimensional viscous flow equations which have been developed to solve for the flow field around a cone at angle of attack.

## SECTION III

## APPLICATION TO CONE AT ANGLE OF ATTACK

### A. GOVERNING EQUATIONS

The numerical technique which was developed in the previous section will be applied to a complicated system of three-dimensional viscous flow equations which have been derived to predict the flow around a cone at angle of attack. The system of equations has been derived from the steady Navier-Stokes equations by assuming the gradients of the shear stress in the streamwise direction are much smaller than the gradients in the normal and circumferential directions (Ref. 6). The coordinate system used in the development of the equations is illustrated in Figure 1.

The resulting nondimensional equations are listed below:

Continuity equation

$$\frac{\partial \rho u r}{\partial x} + \frac{\partial \rho v r}{\partial y} + \frac{\partial \rho w}{\partial \Phi} = 0 \tag{7}$$

x-momentum equation

$$\frac{\partial \rho u^2 r}{\partial x} + \frac{\partial \rho u v r}{\partial y} + \frac{\partial \rho w u}{\partial \Phi} - \rho w^2 \sin\theta + r \frac{\partial p}{\partial x}$$

$$= \frac{r}{Re} \left\{ \frac{\partial}{\partial y}\left(\mu \frac{\partial u}{\partial y}\right) + \frac{1}{r^2} \frac{\partial}{\partial \Phi}\left(\mu \frac{\partial u}{\partial \Phi}\right) + \frac{\mu}{r} \frac{\partial u}{\partial y} \cos\theta \right\} \tag{8}$$

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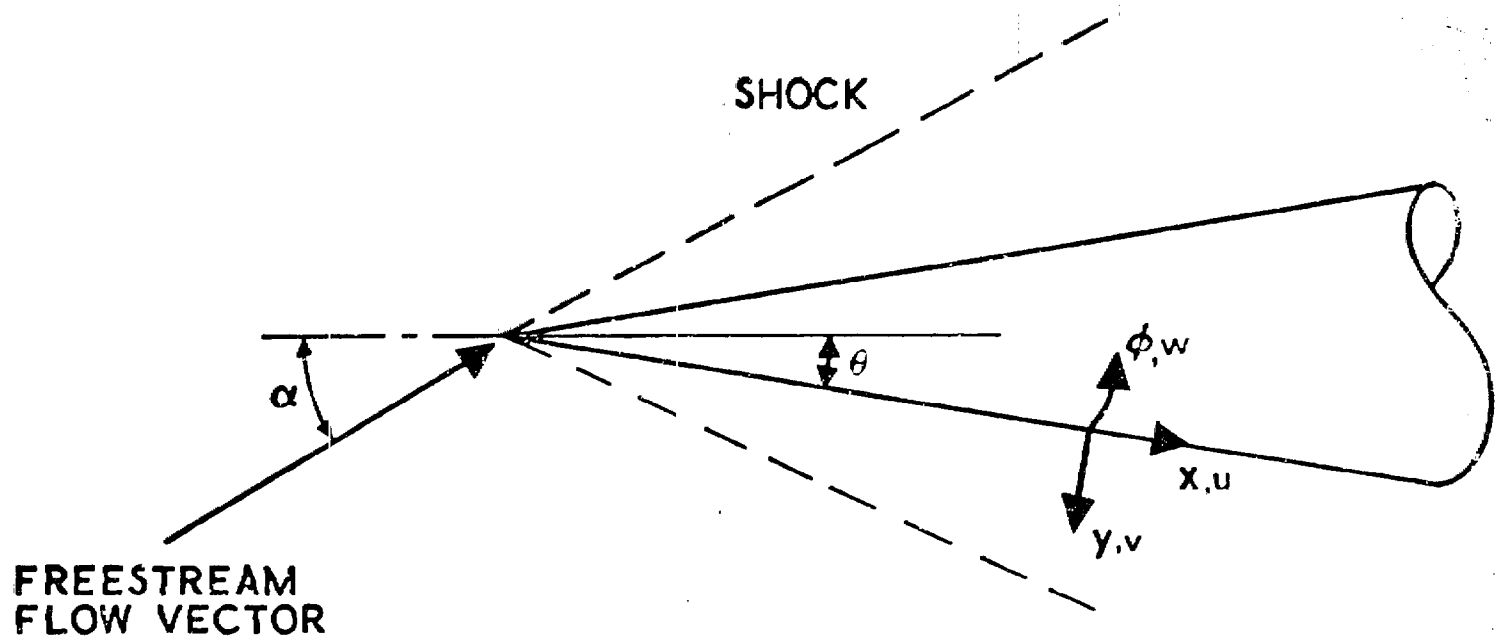


Figure 1. Coordinate System

y-momentum equation

$$\frac{\partial \rho u v r}{\partial x} + \frac{\partial \rho v^2 r}{\partial y} + \frac{\partial \rho v w}{\partial \Phi} - \rho w^2 \cos\theta + r \frac{\partial p}{\partial y}$$

$$= \frac{r}{Re} \left\{ \frac{4}{3} \frac{\partial}{\partial y} \left( \mu \frac{\partial v}{\partial y} \right) + \frac{1}{r^2} \frac{\partial}{\partial \Phi} \left( \mu \frac{\partial v}{\partial \Phi} \right) \right.$$

$$\left. + \frac{1}{r} \frac{\partial}{\partial \Phi} \left( \mu \frac{\partial w}{\partial y} \right) - \frac{2}{3} \frac{\partial}{\partial y} \left( \frac{\mu}{r} \frac{\partial w}{\partial \Phi} \right) \right\} \tag{9}$$

$\Phi$-momentum equation

$$\frac{\partial \rho u w r}{\partial x} + \frac{\partial \rho v w r}{\partial y} + \frac{\partial \rho w^2}{\partial \Phi} + \rho u w \sin\theta + \rho v w \cos\theta + \frac{\partial p}{\partial \Phi}$$

$$= \frac{r}{Re} \left\{ \frac{\partial}{\partial y} \left( \frac{\mu}{r} \frac{\partial v}{\partial \Phi} \right) - \frac{2}{3r} \frac{\partial}{\partial \Phi} \left( \mu \frac{\partial v}{\partial y} \right) + \frac{\partial}{\partial y} \left( \mu \frac{\partial w}{\partial y} \right) + \frac{4}{3r^2} \frac{\partial}{\partial \Phi} \left( \mu \frac{\partial w}{\partial \Phi} \right) \right\} \tag{10}$$

Energy equation

$$\frac{\partial \rho u r h}{\partial x} + \frac{\partial \rho v r h}{\partial y} + \frac{\partial \rho w h}{\partial \Phi} = (\gamma - 1) M_\infty^2 \, r \left\{ u \frac{\partial p}{\partial x} + v \frac{\partial p}{\partial y} + \frac{w}{r} \frac{\partial p}{\partial \Phi} \right\}$$

$$+ \frac{\mu r (\gamma - 1) M_\infty^2}{Re} \left\{ \left( \frac{\partial u}{\partial y} \right)^2 + \frac{1}{r^2} \left( \frac{\partial u}{\partial \Phi} \right)^2 + \left( \frac{\partial w}{\partial y} \right)^2 + \frac{4}{3r^2} \left( \frac{\partial w}{\partial \Phi} \right)^2 \right.$$

$$\left. + \frac{4}{3} \left( \frac{\partial v}{\partial y} \right)^2 + \frac{1}{r^2} \left( \frac{\partial v}{\partial \Phi} \right)^2 - \frac{4}{3r} \frac{\partial v}{\partial y} \frac{\partial w}{\partial \Phi} + \frac{2}{r} \frac{\partial v}{\partial \Phi} \frac{\partial w}{\partial y} \right\}$$

$$+ \frac{r}{Re \, Pr} \left\{ \frac{1}{r} \frac{\partial}{\partial y} \left( r \mu \frac{\partial h}{\partial y} \right) + \frac{1}{r^2} \frac{\partial}{\partial \Phi} \left( \mu \frac{\partial h}{\partial \Phi} \right) \right\} \tag{11}$$

where the perfect gas equation of state is used to relate the density to the pressure and enthalpy

$$\rho = \gamma M_\infty^2 \frac{p}{h} \tag{12}$$

and Sutherland's law is used to relate the viscosity to the enthalpy

$$\mu = \sqrt{h}\ \frac{1+S}{1+S/h} \tag{13}$$

A constant Prandtl number and specific heat will also be assumed.

The above equations are similar to those used by Lin and Rubin (Ref. 7) except the terms associated with $r \to 0$ have been dropped. These terms are important only near the tip at low Reynolds number. We will be interested in solving the higher Reynolds number cases downstream of the tip region. The following boundary conditions at the cone surface are used.

$$u = v = w = 0$$

$$h_w = \text{specified constant} \tag{14}$$

$$\left(\frac{\partial p}{\partial y}\right)_w = \frac{1}{Re}\left(\frac{4}{3}\,\mu\,\frac{\partial^2 v}{\partial y^2} + \frac{1}{r}\,\frac{\mu}{3}\,\frac{\partial^2 w}{\partial y \partial \Phi}\right)$$

The last equation has been obtained from the v-momentum equation using the condition $(\partial v/\partial y)_w = 0$ which is required in order that the continuity equation is satisfied at the wall.

The following difference formulas are used in the $(\partial p/\partial y)_w$ equation:

$$\left(\frac{\partial^2 w}{\partial y \partial \Phi}\right)_w = \left.\frac{\partial w}{\partial \Phi}\right|_{k=2} / \Delta y$$

$$\left(\frac{\partial^2 v}{\partial y^2}\right)_w = 2 v_{k=2} / \Delta y^2$$

and are obtained from Taylor series expansions in the normal direction of $\left.\frac{\partial w}{\partial \Phi}\right|_{k=2}$ and $v_{k=2}$.

The Rankine-Hugoniot jump conditions are applied at the shock boundary. In the body-oriented coordinate system (Figure 1) they are

Conservation of mass equation

$$(u_\infty - \rho_K u_K)\frac{\partial \xi}{\partial x} - (v_\infty - \rho_K v_K) + (w_\infty - \rho_K w_K)\frac{1}{r}\frac{\partial \xi}{\partial \Phi} = 0 \tag{15}$$

Conservation of normal momentum equation

$$\frac{\left(u_\infty \frac{\partial \xi}{\partial x} - v_\infty + w_\infty \frac{1}{r}\frac{\partial \xi}{\partial \Phi}\right)^2}{\left(\frac{\partial \xi}{\partial x}\right)^2 + 1 + \left(\frac{1}{r}\frac{\partial \xi}{\partial \Phi}\right)^2} + p_\infty = p_K + \frac{\left(u_K \frac{\partial \xi}{\partial x} - v_K + w_K \frac{1}{r}\frac{\partial \xi}{\partial \Phi}\right)^2}{\left(\frac{\partial \xi}{\partial x}\right)^2 + 1 + \left(\frac{1}{r}\frac{\partial \xi}{\partial \Phi}\right)^2} \tag{16}$$

Conservation of tangential velocities equations

$$(u_\infty - u_K)\left[1 + \left(\frac{1}{r}\frac{\partial \xi}{\partial \Phi}\right)^2\right] + (v_\infty - v_K)\frac{\partial \xi}{\partial x} - (w_\infty - w_K)\frac{1}{r}\frac{\partial \xi}{\partial \Phi}\frac{\partial \xi}{\partial x} = 0$$

$$(v_\infty - v_K)\frac{1}{r}\frac{\partial \xi}{\partial \Phi} + (w_\infty - w_K) = 0 \tag{17}$$

Conservation of energy equation

$$\frac{(\gamma-1)M_\infty^2}{2} V_\infty^2 + h_\infty = h_K + \frac{(\gamma-1)M_\infty^2}{2}\left(u_K^2 + v_K^2 + w_K^2\right) \tag{18}$$

The subscript K denotes the value of the variable just inside the shock. In order to uniquely determine the six unknowns $\xi$, $u_K$, $v_K$, $w_K$, $p_K$, $h_K$, the above five equations must be augmented with a sixth equation. A one-sided differencing of the continuity equation provides the sixth equation. Full justification and discussion of the above equations and boundary conditions are presented in Ref. 6).

Since the fluid flow is symmetric about the plane $\Phi = 0$ and $\Phi = \pi$, the equations used will be solved for $0 \leq \Phi \leq \pi$ where the symmetry conditions

$$\frac{\partial}{\partial \Phi}(u, v, p, h, \xi) = 0; \quad w = \frac{\partial^2 w}{\partial \Phi^2} = 0 \tag{19}$$

are used at $\Phi = 0$ and $\Phi = \pi$. (Note: $\Phi = 0$ is the windward side.)

The shock distance is to be solved for from the Rankine-Hugoniot jump conditions. In a rectangular $y$-$\Phi$ grid the shock may not fall on a mesh point so that mesh points would have to be moved or added to accommodate the shock. Thus, the transformation $\eta = y/\xi(x, \Phi)$ is made. The resulting equations are then solved for $0 \leq \eta \leq 1$, $0 \leq \Phi \leq \pi$, where $\eta = 0$ corresponds to the cone and $\eta = 1$ corresponds to the shock. The shock distance $\xi$ appears in all the equations and in order to keep the matrix of coefficients obtained from the difference form of the equation in block tri-diagonal form, a sixth equation

$$\frac{\partial \xi}{\partial \eta} = 0 \tag{20}$$

is differenced. Thus the problem to be solved consists of six differential equations, six boundary conditions at each of the positions $\eta = 0$ and $\eta = 1$ and two symmetry conditions at $\Phi = 0$ and $\Phi = \pi$ [Eqs. (7) through (20)] in the six unknowns $u, v, w, p, h, \xi$.

If initial conditions were known, a marching scheme in x could be used to solve the equations. An explicit method would not work since, as shown by Baum and Denison [Eq. (12)] for the axisymmetric problem, it is not possible to solve for $\partial u/\partial x$, $\partial v/\partial x$, $\partial w/\partial x$, $\partial p/\partial x$, $\partial h/\partial x$, at $M_x = 1$. Even if this difficulty could be overcome the diffusive stability requirement would be too strict. Since the gradients in the normal direction are much larger than in the circumferential direction, the normal mesh will be much finer than the circumferential mesh. Thus a method that is implicit in the normal direction should be more efficient than a modified explicit differencing such as DuFort-Frankel or Crocco. Accurate solutions at each x-station are desired

and since the equations are very nonlinear they require iteration for accuracy. The method proposed in the previous section is most appropriate for this problem.

An alternating direction implicit technique was tried, with iteration to handle the nonlinearities. It was found that near $u = 0$ and $M_x = 1$, the equations for the implicit in $\Phi$ step were ill-conditioned and meaningful solutions could not be obtained. The $M_x = 1$ difficulty was overcome by evaluating the $\partial p/\partial x$ term backwards in x in the x-momentum and energy equations. However, the $u = 0$ difficulty remained.

The implicit difference equations [Eqs. (2) and (3)] are substituted into the partial differential equations and a system of nonlinear algebraic equations result. There are many ways to linearize such a system. Since convergence is guaranteed provided the initial guess is close enough, and because the convergence is quadratic, the Newton-Raphson method is used to solve these equations. That is, the nonlinear terms are expanded in a Taylor series and terms higher than first order are dropped. It is known that this iteration procedure converges provided the initial guess is close enough to the solution. It was found that linearly extrapolating the solution at the previous two x stations gives a satisfactory initial guess. To see what linearization does to various terms let $\bar{f}$ represent the increment to be added to the known iterate and the superscript n denote that iterate. A few sample expressions are

$$\frac{\partial \rho u r}{\partial x} = \left(\frac{\partial \rho u r}{\partial x}\right)^n + \bar{u}\,\frac{(\rho r)^n}{\Delta x} + \frac{(u r)^n}{\Delta x}\left(\frac{\partial \rho}{\partial p}\,\bar{p} + \frac{\partial \rho}{\partial h}\,\bar{h}\right) + \bar{r}\,\frac{(\rho u)^n}{\Delta x}$$

$$\frac{\partial \rho w}{\partial \Phi} = \left(\frac{\partial \rho w}{\partial \Phi}\right)^n + \frac{\partial(\rho^n \bar{w})}{\partial \Phi} + \frac{\partial}{\partial \Phi}\left(w^n\,\frac{\partial \rho}{\partial p}\,\bar{p} + w^n\,\frac{\partial \rho}{\partial h}\,\bar{h}\right)$$

$$\mu\,\frac{\partial^2 v}{\partial \Phi^2} = \left(\mu\,\frac{\partial^2 v}{\partial \Phi^2}\right)^n + \bar{h}\left(\frac{d\mu}{dh}\,\frac{\partial^2 v}{\partial \Phi^2}\right)^n + \mu^n\,\frac{\partial^2 \bar{v}}{\partial \Phi^2}$$

The $\bar{r}$ term above is $\bar{r} = \bar{\xi}\,\eta\cos\Phi$, since $x_{j+1}\sin\theta$ is known. The linear system of equations obtained are solved for $\bar{u}, \bar{v}, \bar{w}, \bar{p}, \bar{h}$, and $\bar{\xi}$ using the line Gauss-Seidel method described in the previous section. However, only one iteration of the line Gauss-Seidel method is performed. The approximate solutions so obtained are then used to obtain the next guess to the nonlinear system.

For this flow problem the L systems of equations that must be solved to obtain one Gauss-Seidel iterate are of order 6 * K since there are six variables involved. The matrix of coefficients is of block tridiagonal form. An efficient method for solving such systems is presented in Isaacson and Keller (Ref. 10) and was used by Rubin and Lin (Ref. 4) and also in the present analysis.

## B. CONVERGENCE AND STABILITY

The questions of convergence and stability must be investigated for the system of flow equations. To consider convergence, the equations are simplified. First the equations are written in a different form by expanding the derivative expressions and subtracting the continuity equation from the momentum equation and the energy equation. For simplicity it is assumed that $\mu/Pr = 4/3\ \mu = \mu$. The viscosity is assumed to be constant and the shock distance is assumed to be known. Since the iteration is primarily for the $\Phi$ derivative terms, then all terms not involving derivatives with respect to $\Phi$ exclusively are ignored. The following equations are left.

$$\frac{\partial u}{\partial x} + \underline{\frac{1}{\rho u}\frac{\partial p}{\partial x}} + \frac{w}{ur}\frac{\partial u}{\partial \Phi} - Re^{*}\frac{\partial^2 u}{\partial \Phi^2} = 0$$

$$\frac{\partial v}{\partial x} + \frac{w}{ur}\frac{\partial v}{\partial \Phi} - Re^{*}\frac{\partial^2 v}{\partial \Phi^2} = 0 \qquad (21a)$$

$$\frac{\partial w}{\partial x} + \frac{w}{ur}\frac{\partial w}{\partial \Phi} - Re^{*}\frac{\partial^2 w}{\partial \Phi^2} + \frac{h}{ur\gamma M_{\infty}^2 p}\frac{\partial p}{\partial \Phi} = 0$$

$$\frac{\partial p}{\partial x} + \frac{p}{u}\frac{\partial u}{\partial x} - \frac{p}{h}\frac{\partial h}{\partial x} + \frac{w}{ur}\frac{\partial p}{\partial \Phi} + \frac{p}{ur}\frac{\partial w}{\partial \Phi} - \frac{w}{ur}\frac{p}{h}\frac{\partial h}{\partial \Phi} = 0$$

$$\frac{\partial h}{\partial x} - \underline{\frac{\gamma-1}{\gamma}\frac{h}{p}\frac{\partial p}{\partial x}} + \frac{w}{ur}\frac{\partial h}{\partial \Phi} - Re^{*}\frac{\partial^2 h}{\partial \Phi^2} - \frac{\gamma-1}{\gamma}\frac{w}{ur}\frac{h}{p}\frac{\partial p}{\partial \Phi} = 0 \tag{21b}$$

where

$$Re^{*} = \frac{1}{Re}\frac{uh}{ur^2\gamma M_{\infty}^2 p}$$

To further simplify the analysis, assume that all coefficients of the derivative terms are constant, and that the mesh spacings are constant $\Delta x$, $\Delta y$, and $\Delta\Phi$ in the x, y, and $\Phi$ directions, respectively. After differencing and some rearranging, the line Gauss-Seidel iteration method reduces the difference equation for u at each mesh point to

$$u^{n+1}_{j+1,k,\ell} + \frac{1}{\rho u}p^{n+1}_{j+1,k,\ell} + \frac{w}{ur}\frac{\Delta x}{2\Delta\Phi}\left(u^{n}_{j+1,k,\ell+1} - u^{n+1}_{j+1,k,\ell-1}\right)$$

$$- Re^{*}\frac{\Delta x}{\Delta\Phi^2}\left(u^{n}_{j+1,k,\ell+1} - 2u^{n+1}_{j+1,k,\ell} + u^{n+1}_{j+1,k,\ell-1}\right) = u_{j,k,\ell} + \frac{1}{\rho u}p_{j,k,\ell} \tag{22}$$

with similar expressions for the other equations, where the superscript n denotes the known iterate, the superscript n+1 denotes the next (unknown) iterate, and the right hand side of the equations are at j and so are independent of the iterate.

The convergence of the solution of the system of difference equations represented by Eq. (22) can be determined using the Fourier series method as presented in Ref. 11. The solutions will converge if the eigenvalues of the associated amplification matrix are less than one in absolute value. To

obtain the eigenvalues substitute $u_o e^{im\ell\Delta\Phi}$ and $\lambda u_o e^{im\ell\Delta\Phi}$ for $u^n_{j+1,k,\ell}$ and $u^{n+1}_{j+1,k,\ell}$, and similarly for v, w, p, h; this gives five linear equation in $u_o$, $v_o$, $w_o$, $p_o$, and $h_o$, and the eigenvalues of the amplification matrix are those values of $\lambda$ for which the determinant of the coefficient matrix is zero.

For the above system it has been found in regions of the flow where $M_x$ is near one or less than one, that some of the eigenvalues of the amplification matrix are greater than one, in absolute value, independent of $\Delta x$ and $\Delta\Phi$. However, if the $\partial p/\partial x$ term in the x-momentum and energy equation are differenced backwards in x, i.e.

$$\frac{\partial p}{\partial x} = \frac{p_{j,k,\ell} - p_{j-1,k,\ell}}{\Delta x} \tag{23}$$

as suggested by Ohrenberger and Baum (Ref. 13), or set equal to zero as suggested by Rubin and Lin (Ref. 14), then convergence criteria can be obtained. Doing either of the above modifications causes the difference expressions representing the underlined terms in Eq. (21) to be independent of the iteration index n. Thus, the first and second difference equations are uncoupled from the rest of the system and are similar to the simple equation in Section II. Therefore $|\lambda| < 1$ if

$$\Delta x < \left|\frac{ur}{w}\right| \Delta\Phi \tag{24}$$

The remaining three equations are studied using the Fourier series method. If the determinant of the associated three by three matrix of coefficients is set equal to zero, it can be found that a third value of $\lambda$ is the same as the first two above, and so Eq. (24) must be satisfied. The remaining two values satisfy a complicated quadratic equation. To simplify the analysis the first and second derivative terms are handled separately. For second derivative terms only, it can be easily shown that both roots of the

quadratic equation are less than one in absolute value. For first derivative terms only, it can be shown after considerable effort that the two roots of the quadratic equation are less than one in absolute value if and only if

$$\Delta x < \frac{2\,|ur|\,\Delta\Phi}{|w|\left(1+\frac{1}{\gamma}\right)+\sqrt{\left(1-\frac{1}{\gamma}\right)^2 w^2+\frac{4h}{\gamma M_\infty^2}}} \tag{25}$$

The results as represented by Eqs. (24), (25) apply to the simplified linear system Eq. (21). It has been found numerically that the restriction for the actual nonlinear system of equations [Eqs. (7) through (20)] is qualitatively like Eqs. (24), (25). Quantitatively the restriction is similar to Eq. (24).

Once the solution can be obtained at $x_{j+1}$, the question of whether the scheme is stable for marching in the x direction must be answered. To analyze the stability, the following system is considered.

$$\begin{aligned}
&\frac{\partial u}{\partial x}+\frac{1}{\rho u}\frac{\partial p}{\partial x}-Re^*\left(\frac{\partial^2 u}{\partial\Phi^2}+r^2\frac{\partial^2 u}{\partial y^2}\right)=0\\
&\frac{\partial v}{\partial x}-Re^*\left(\frac{\partial^2 v}{\partial\Phi^2}+r^2\frac{\partial^2 v}{\partial y^2}\right)=0\\
&\frac{\partial w}{\partial x}-Re^*\left(\frac{\partial^2 w}{\partial\Phi^2}+r^2\frac{\partial^2 w}{\partial y^2}\right)=0\\
&\frac{\partial p}{\partial x}+\frac{p}{u}\frac{\partial u}{\partial x}-\frac{p}{h}\frac{\partial h}{\partial x}=0\\
&\frac{\partial h}{\partial x}-\frac{\gamma-1}{\gamma}\frac{h}{p}\frac{\partial p}{\partial x}-Re^*\left(\frac{\partial^2 h}{\partial\Phi^2}+r^2\frac{\partial^2 h}{\partial y^2}\right)=0
\end{aligned} \tag{26}$$

The above equations are differenced implicitly and the resulting equations are studied using the Fourier series technique. The equations are stable if the eigenvalues of the amplification matrix are less than or equal to one in absolute value. The second and third equations are uncoupled from the system. It can easily be shown that they are unconditionally stable.

For the remaining three equations one of the eigenvalues is $\lambda = 1$, and another is

$$\lambda = \frac{1}{1 - 2\,Re^{*}\left[(\cos m_1\Delta\Phi - 1)\,\frac{\Delta x}{\Delta\Phi^2} + (\cos m_2\Delta y - 1)\,\frac{r^2\Delta x}{\Delta y^2}\right]} \tag{27}$$

which is less than or equal to one in absolute value.

Since the first four eigenvalues are less than or equal to one in absolute value, the stability of the system of Eq. (26) depends on the magnitude of the fifth and final one. Three different cases are considered depending on how the $\partial p/\partial x$ term in the x-momentum and energy equations is differenced. In the first case, if $\partial p/\partial x$ is set to zero as suggested by Rubin and Lin (Ref. 14), then the fifth eigenvalue is the same as Eq. (27). Thus, the difference equations are unconditionally stable as a marching scheme in x.

The second case corresponds to evaluating $\partial p/\partial x$ backwards in x [Eq. (23)], as suggested by Ohrenberger and Baum (Ref. 13). If $M_x \geqq 1$ then it can be shown that the magnitude of the eigenvalue is less than or equal to one. However, if $M_x < 1$, which occurs near the cone due to the boundary condition $u = 0$, the following restriction must be satisfied to ensure that the absolute value of the eigenvalue is less than or equal to one.

$$\Delta x \geqq \left(\frac{1}{M_x^2} - 1\right)\frac{1}{2\gamma Re^{*}}\left[\frac{1}{(1-\cos m_1\Delta\Phi)\,\frac{1}{\Delta\Phi^2} + (1-\cos m_2\Delta y)\,\frac{r^2}{\Delta y^2}}\right] \tag{28}$$

The third case corresponds to taking $\partial p/\partial x$ implicitly. For this case it is found that $\Delta x$ must be twice as big as for the previous case where $\partial p/\partial x$ was evaluated explicitly. This implies that if a different method were used to solve the implicit equations (the proposed Newton-Gauss-Seidel method does not converge when $\partial p/\partial x$ is differenced implicitly as mentioned previously) a numerical solution to the fluid flow equations could be obtained if $\Delta x$ were chosen sufficiently large. A lower bound restriction on the marching step-size has also been found for certain stiff ordinary differential equations by Curtiss and Hirschfelder (Ref. 15) in order to suppress so called departure solutions. The case here is analogous to the ordinary differential equation case. The departure is characterized by the leeward surface pressure oscillating or rapidly increasing, and has been observed by Baum and Denison (Ref. 12), Rubin and Lin (Ref. 14), and Tyson (Ref. 16). Tyson experimentally found that a large stepsize was necessary to suppress the departure solutions.

## SECTION IV

## NUMERICAL RESULTS

To demonstrate the validity of the technique, solutions have been compared with experimental data obtained by Tracy (Ref. 8) on a sharp 10 deg half angle cone at an angle of attack of 12 deg. The parameters used in the calculation are given in Table I. These correspond closely to the experimental data. Initial conditions, which would normally come from a solution to the nose region, are needed before an exact comparison can be obtained. Since the nose solution was not available, the following technique was used to generate the required initial conditions. Starting at zero, the angle of attack was slowly increased while marching along the cone until 12 deg was reached at an $x = x_o$. The calculations are then continued at a constant 12 deg angle of attack, and the solution is allowed to relax to the desired sharp cone results. Because of the method used to generate the initial conditions, the calculations are not expected to agree with the data at the same x station. However, the calculation should relax to results which are similar to the data (except the difference in local Reynolds number) as the solution continues downstream.

Table I. Parameters for Tracy's Case

| Parameter | Symbol and Value |
|---|---|
| cone half angle | $\theta = 10$ deg |
| angle of attack | $\alpha = 12$ deg |
| freestream Mach number | $M_\infty = 8$ |
| freestream Reynolds number | $Re = 1.1 \times 10^6$/ft |
| freestream Prandtl number | $Pr = 0.75$ |
| ratio of specific heats | $\gamma = 1.4$ |
| Sutherland constant | $S = 2$ |
| freestream dimensionless pressure | $p_\infty = 0.0112$ |
| static enthalpy at the cone | $h_w = 5.5$ |



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Figures 2, 3 show the experimental surface pressure and heat transfer around the cone at $x = 0.33$ ft and the calculated results at $\bar{x} \equiv x/x_o = 8.5$, 25, and 50. The calculated heat transfer results illustrate that at $\bar{x} = 8.5$ the effect of the initial conditions at $x = x_o$ have not yet relaxed. At $x = 25$ and 50 the calculations appear to be approaching a relaxed result and the agreement with the heat transfer data is very good.

In Figure 4, a comparison between the measured and calculated bow shock and viscous layer thickness around the cone is given. The data were taken at $x = 0.286$ ft, the calculated results at $\bar{x} = 50$ are shown. Finally in Figure 5, the calculated velocity vectors on the leeward side projected normal to the streamwise direction are shown. The separated flow region on the leeward side is clearly shown by this figure.

The above results were obtained by evaluating $\partial p/\partial x$ explicitly. Runs were also made with $\partial p/\partial x = 0$ and the results differed very slightly from those presented.

A comparison of actual convergence and stability restrictions with the analytical restrictions for this case is presented in Figure 6. From Eq. (24) with $\Delta\Phi = 10$ deg and taking 1 as a lower bound for $|u/w|$ we see that

$$\frac{\Delta x}{x} < 0.03 \tag{29}$$

is necessary for convergence. Equation (28) implies that the biggest restriction occurs for small u, that is near to the cone. To simplify the expression, suppose that $\cos m_1\Delta\Phi$ and $\cos m_2\Delta y$ are zero. This is not strictly valid; however, we are looking for an approximate answer. Making this assumption may not give us precise quantitative results but hopefully qualitative results will be obtained. For the cases run, $\Delta y << r\Delta\Phi$. The nearest point to the cone that is solved for corresponds to $y = \Delta y$. The functions p and $\mu$ evaluated at $\Delta y$ are approximately constant as functions of x. Also it

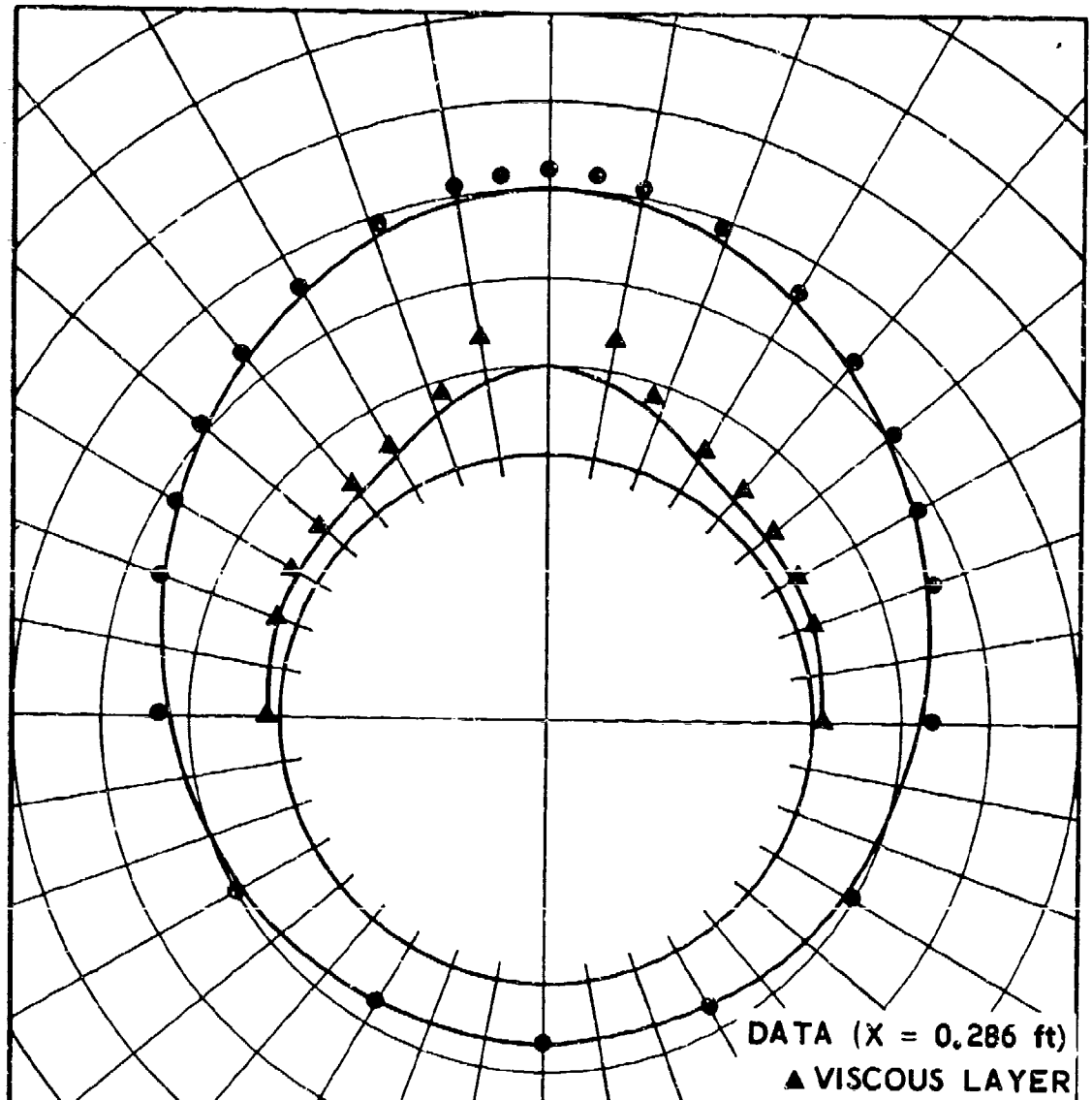


Figure 2. Geometry of the Flow for Tracy's Case, $\alpha$ = 12 deg

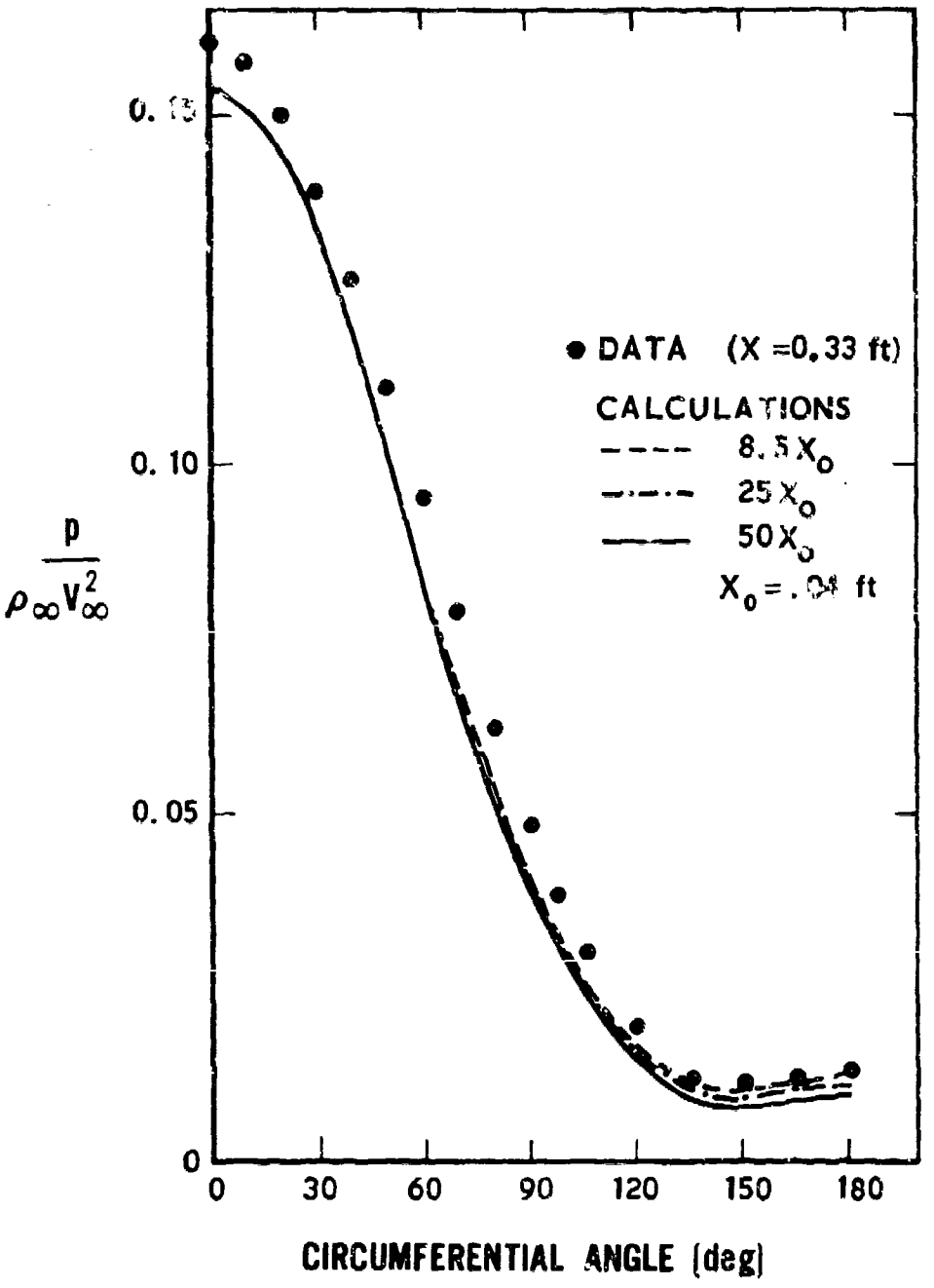


Figure 3. Circumferential Surface Pressure Distribution for Tracy's Case, $\alpha$ = 12 deg

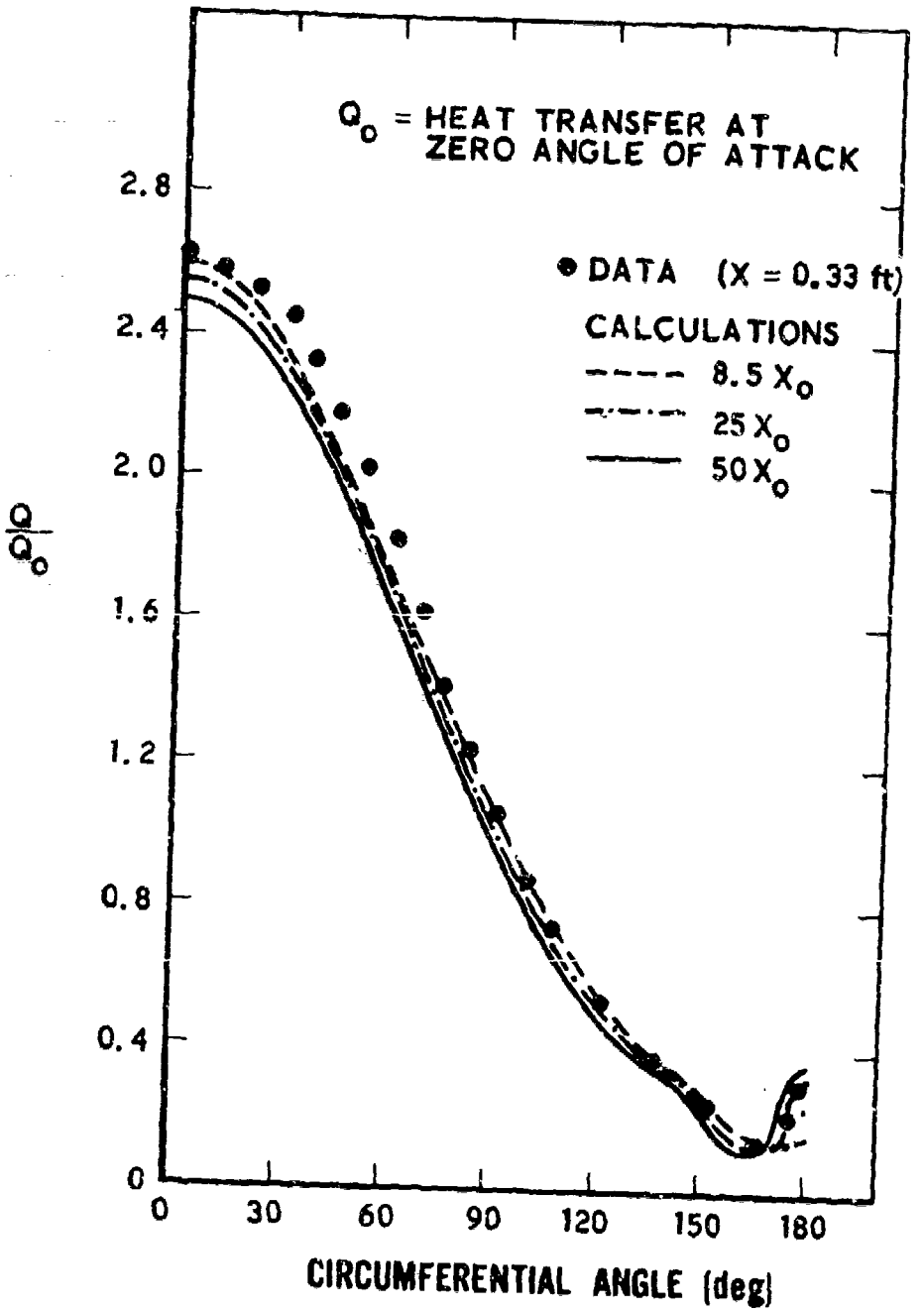


Figure 4. Circumferential Heat Transfer Distribution for Tracy's Case, $\alpha$ = 12 deg

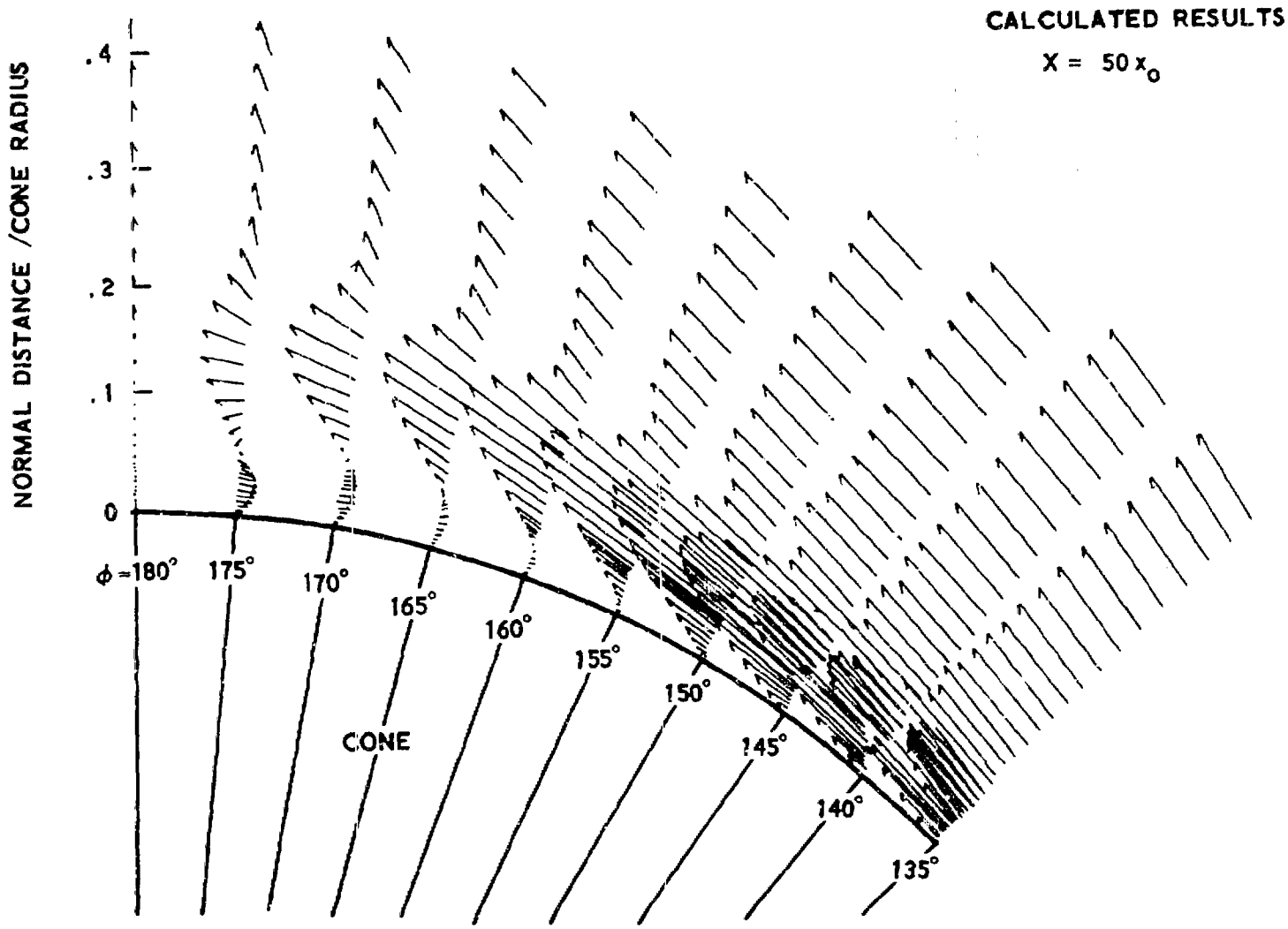


Figure 5. y - Φ Velocity Vector Distribution for Tracy's Case, $\alpha$ = 12 deg

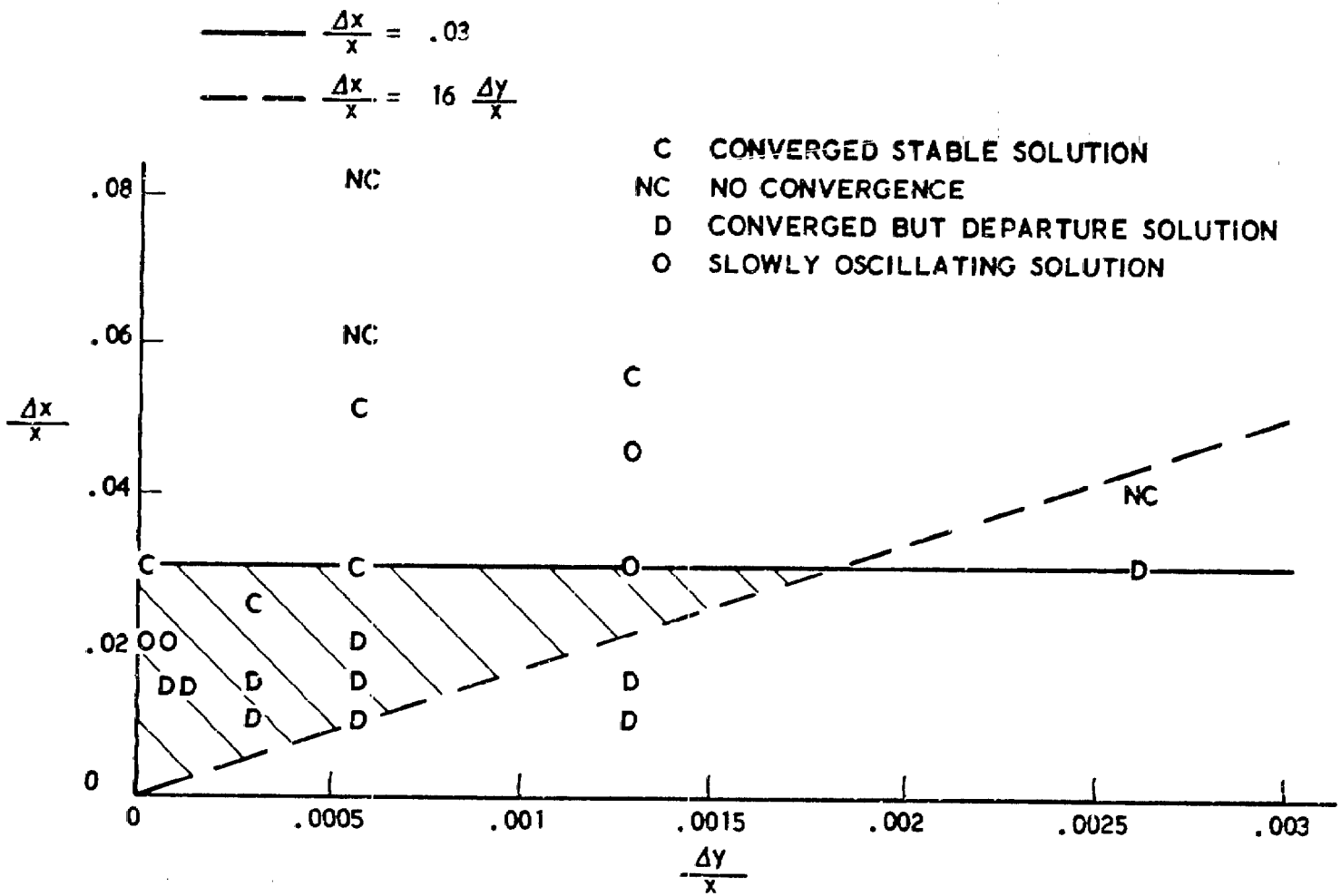


Figure 6. Comparison of Analytical and Numerical Results

has been observed that the ratio $\Delta y/u$ where u is evaluated at $y = \Delta y$ is almost constant as a function of x. Thus Eq. (28) is approximately

$$\frac{\Delta x}{x} = \left[\frac{Rep}{2\mu} \Delta y\right] \frac{\Delta y}{x} \tag{30}$$

where the expression in brackets in Eq. (30) is approximately constant. In addition, since the transformation $y = \eta\xi$ is made, $\Delta y = \Delta\eta\xi$; and since $\xi$ increases approximately linearly with x, then $\Delta y/x$ remains constant as x increases. Equation (30) then implies that for an initially chosen $\Delta y$, $\Delta x$ must increase linearly as x increases. Therefore if $\Delta y$ is chosen so that Eqs. (30), (29) are satisfied initially, they will be satisfied for all x provided $\Delta x$ increases proportionally to x.

Tracy's case was run with $\Delta x/x = 0.03$ and a $\Delta\eta$ spacing such that initially $\Delta y/x = 0.0006$. The expression in brackets in Eq. (30) is equal to 16 so that Eq. (30) is satisfied. With $\Delta\Phi = 10$ several different values for $\Delta x$ and $\Delta y$ were used to determine how accurate the derived inequalities are. The results are shown in Figure 6. The shaded region is the predicted area where convergent stable solutions should be obtained. The actual region of convergent stable solutions is somewhat different. However, the qualitative results are correct. It was found that increasing $\Delta x$ slowed down the convergence of the iterative procedure to obtain the solution at an x station until finally it did not converge. Decreasing $\Delta x$ sped up the convergence but produced solutions that departed as a function of x. Increasing $\Delta y$ led to departure solution and decreasing $\Delta y$ led to stable solutions. For a few cases the results for the surface pressure on the leeward side (the most critical for departure) at $\alpha = 12$ deg are shown in Figure 7.

A second case has been run to compare with experimental data obtained by Stetson and Ojdana (Ref. 9) on a sharp 5.6 deg half angle cone at an angle of attack of 8 deg. The parameters used in the calculation are given in Table II. Figure 8 shows the wall pressure distribution on the leeward side at $\bar{x} = 17$. Stetson's case was run with $\partial p/\partial x = 0$. Analysis of the restrictions

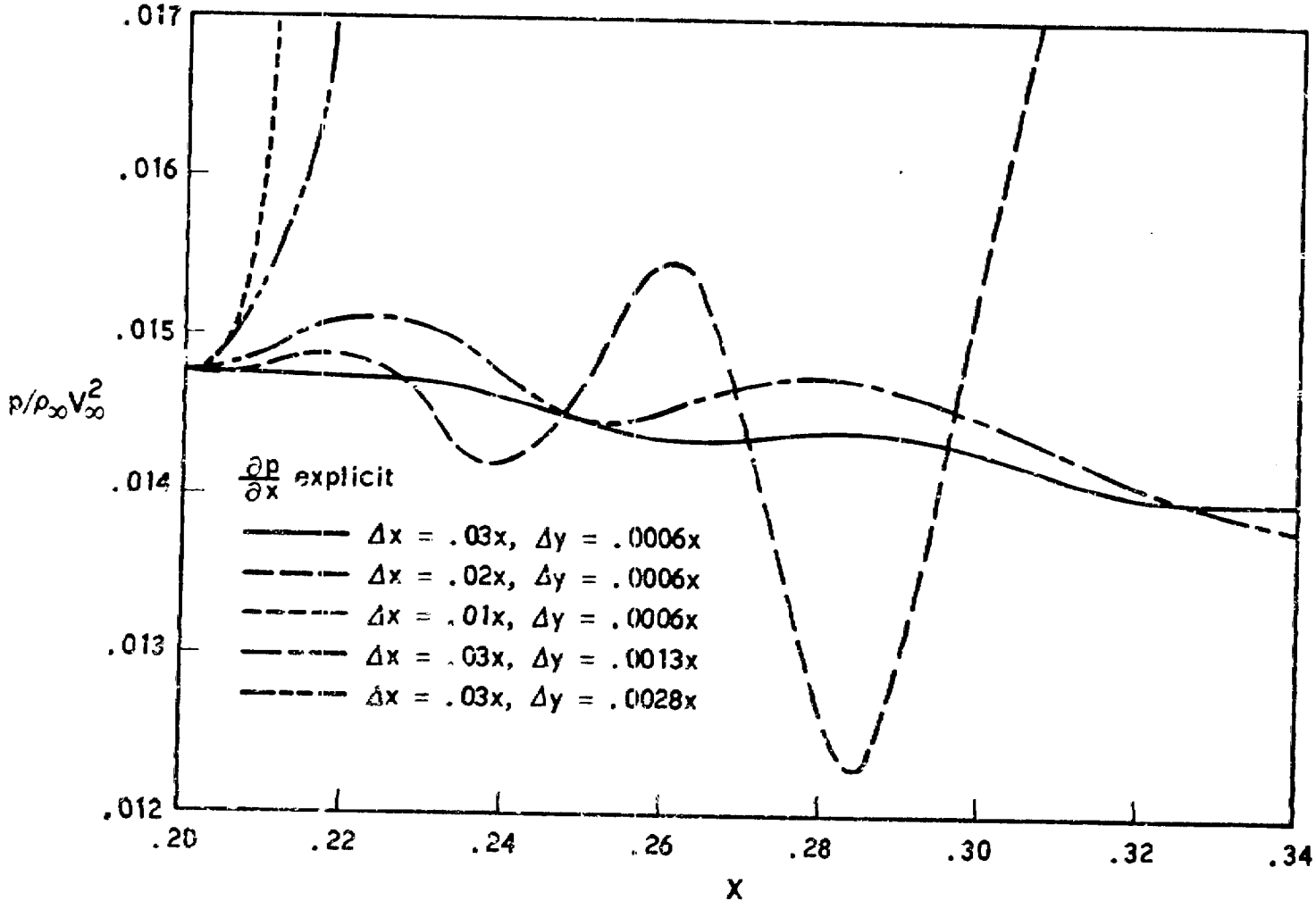


Figure 7. Leeward Surface Pressure for Different Values of $\Delta x$ and $\Delta y$

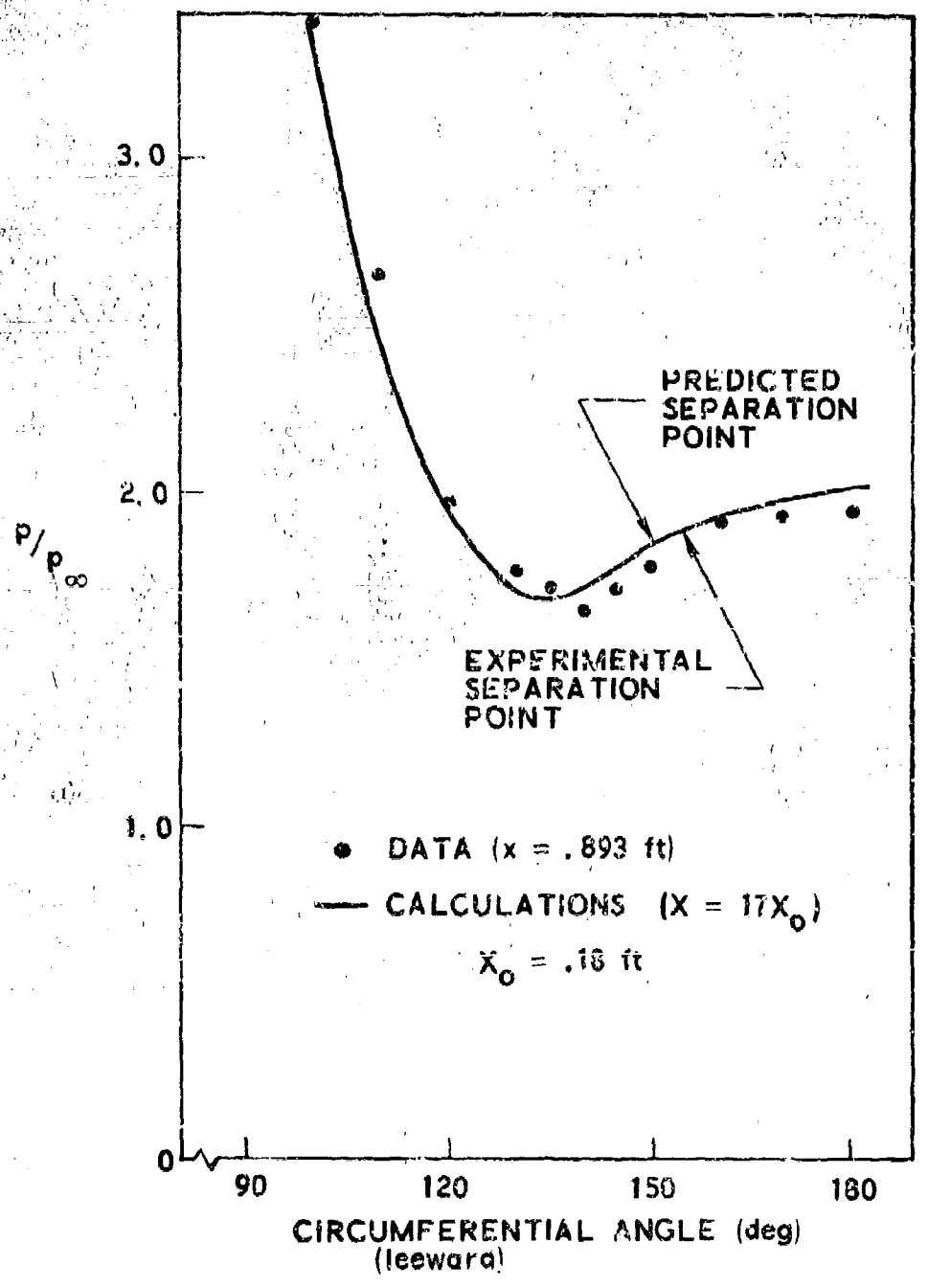


Figure 8. Circumferential Surface Pressure Distribution for Stetson's Case, $\alpha$ = 8 deg

on $\Delta x$ for $\partial p/\partial x$ evaluated explicitly as was done for Tracy's case led to $\Delta x$ spacings that were much too small in the sense that too many y mesh points were required and the storage capability of the computer was exceeded. Numerical experimentation verified that the solution could not be obtained for any permissable mesh spacing when $\partial p/\partial x$ was evaluated explicitly.

Table II. Parameters for Stetson's Case

| Parameter | Symbol and Value |
|---|---|
| cone half angle | $\theta = 5.6$ deg |
| angle of attack | $\alpha = 8$ deg |
| freestream Mach number | $M_\infty = 14.2$ |
| freestream Reynolds number | $Re = 0.83 \times 10^6$/ft |
| freestream Prandtl number | $Pr = 0.75$ |
| ratio of specific heats | $\gamma = 1.4$ |
| Sutherland constant | $S = 4$ |
| freestream dimensionless pressure | $p_\infty = 0.00354$ |
| static enthalpy at the cone | $h_w = 32.398$ |

## SECTION V

## COMPUTER PROGRAM

A computer program has been developed for the CDC/7600 computer that solves the above equations. Provision has been made for variable grid sizes in both the y and $\Phi$ directions and this feature has been used heavily. The iteration logic has been structured so that when the solution along a $\Phi$ line converges to the desired number of figures, that line is dropped from the iteration loop. This saves considerable time since a few $\Phi$ lines require as many as seven iterations to converge to five figures while most $\Phi$ lines require only two or three iterations.

For 50 points in the y direction and 23 points in the $\Phi$ direction the program requires 35,000 words of storage. It takes 30 sec to obtain the solution accurate to five figures at one x station. Eleven percent of this time is spent evaluating all the derivative expressions, 33 percent is spent computing the Jacobian coefficient matrix, and 56 percent is spent solving the linear equations. For Tracy's case it took about 120 steps to go from $\bar{x} = 1$ to $\bar{x} = 50$.

For convenience in programming the derivatives were defined as

$$\frac{\partial u^n}{\partial \Phi} = \left(u^n_{j+1,k,\ell+1} - u^{n+1}_{j+1,k,\ell-1}\right) \Big/ 2\Delta\Phi$$

$$\frac{\partial^2 u^n}{\partial \Phi^2} = \left(u^n_{j+1,k,\ell+1} - 2u^{n+1}_{j,k,\ell} + u^{n+1}_{j,k,\ell-1}\right) \Big/ \Delta\Phi^2$$

The right hand side of Eq. (4) became

$$-\frac{\partial u^n}{\partial x} - a\frac{\partial u^n}{\partial \eta} - b\frac{\partial u^n}{\partial \Phi} + c\frac{\partial^2 u^n}{\partial \eta^2} + d\frac{\partial^2 u^n}{\partial \Phi^2}$$

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where the underlined terms in Eq. (4) have been ignored. It is seen that it is necessary to store only two planes of the solution, one at j and one for the current iterate at j+1. The n+1 iterate is stored on top of the n iterate as it is computed.

## SECTION VI

## DISCUSSION AND CONCLUSIONS

A method for solving the implicit difference equations describing the three-dimensional flow around a cone at angle of attack has been described and analyzed. These equations which are derived and discussed in Ref. 6 constitute a system of three-dimensional nonlinear parabolic equations. The technique for solving these equations has been shown to be accurate and efficient in both running time and computer storage.

The numerical method is not restricted to steady flow problems but could easily be applied to two-dimensional time dependent calculations.

An analysis of the numerical aspect of departure solutions has been presented. Methods that have been proposed by other authors to suppress the departure solutions have been verified and in some cases qualified. In addition, it has been shown that departure solutions can be suppressed even if the streamwise pressure derivative is included, if the steps ze is large enough.

Results have been compared with experimental data and the agreement is very good.

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## APPENDIX A

## PROGRAM INPUT INSTRUCTIONS

The input is divided into two sections, namelist input and formatted input. Parameters describing the problem are read using NAMELIST/INPUT/.

| | | |
|---|---|---|
| GAMMA | = | $\gamma$ |
| MINF | = | $M_\infty$ |
| THETAC | = | $\theta$ |
| REINF | = | Re |
| PRINF | = | Pr |
| ALFA | = | $\alpha$ |
| PINF | = | $p_\infty$ |
| SPROP | = | S |
| NJ | = | number of x-stations |
| NK | = | number of y-stations at which initial conditions are specified |
| NL | = | number of $\Phi$-stations at which initial conditions are specified |
| MØD | = | .TRUE. or .FALSE. depending on whether the input mesh distribution is to be modified or not. Default is .FALSE. |
| ITAPE | = | 0, no output on TAPE2, this is the default |
| | = | N, output solution on TAPE2 every Nth x-step |

The rest of the input is read using format control.

IREAD (I12)

IREAD > 0 read initial profile from TAPE3, used for restart purposes. The first profile on TAPE 3 at an x station bigger than or equal to X(1) is selected as the initial profile.

IREAD ≤ 0 read initial profile from cards

If IREAD ≤ 0 then the cards with the solution are input

repeat NL times:

FI(L), ZI(1, L) (2E12.5)

FI(L) is a Φ station in degrees

ZI(1, L) is the shock distance at Φ

ET(K), U(K, L), V(K, L), W(K, L), P(K, L), H(K, L), K=1, NK(6E12.5)

ET(K) is a distance from the body (=y not y/shock)

U, V, W, P, H are values of u, v, w, p, h at ET(K), FI(L)

X(J) J=1 or J=1, NJ (6E12.5)

X(J) is an X-station along the body. If J=1 then the rest of the points are obtained using X(J+1) = c * X(J) where c is a constant > 1. X(1) is the position of the initial profile.

The following cards describe v and h at the body:

L (I12)

L is the index of a Φ station

J, VB(J, L), HB(J, L) (I12, 2E12.5)

J is the index of an X station

VB(J, L) is the value of v at the body at X(J), FI(L)

HB(J, L) is the value of h at the body at X(J), FI(L)

This card is repeated with N increasing from 1 to NJ.

If any J stations are skipped then linear interpolation is used to obtain VB and HB at the skipped stations

There then follows a card with another L value and cards with J, VB, and HB. These groups are repeated with L increasing from 1 to NL. If any L stations are skipped then linear interpolation is used to obtain VB and HB at the skipped stations.

If MOD=.TRUE. more cards are needed.

NEWK, NEWL (2I5)

NEWK is a new value for NK, and indicates that the input $\eta$ distribution is to be changed. If the $\eta$ distribution is not to be changed then leave NEWK blank.

NEWL as with NEWK but for NL and $\Phi$.

If NEWK > 0

ETNEW(K) K=1, NEWK (6D12.4).

The numbers must increase from 0. The input numbers are scaled by the program to go from 0. to 1. by dividing by ETNEW (NEWK)

If NEWL > 0

FINEW(L) L=1, NEWL (6D12.4)

These are the new $\Phi$ stations in degrees. They must increase from 0 to 180 deg.

## APPENDIX B

## PROGRAM OUTPUT

The namelist input is printed out. If the initial profiles were read from cards then the card images are printed.

The x-stations at which the solution will be obtained are printed.

The input profiles are printed and if the mesh distribution was changed, then the new initial profiles are printed.

The profiles are printed at each x-station as they are obtained. Preceeding each station printout is printed the iteration and convergence history for that x-station. The variables printed are ITER and INS(L), L=1, NL. If all Φ-rays have converged then ITER=0, otherwise ITER=1. If the Lth Φ-ray has converged then INS(L) = 0, otherwise INS(L) = 1.

The parameters read in with namelist are written on TAPE4, followed by the profiles at each x-station. The data are written without format control and can be used to supply initial conditions.

If ITAPE > 0 then the profiles are written on TAPE2 at each ITAPEth x-station. TAPE2 can be set up as the punch file.

## APPENDIX C

## EXAMPLE PROBLEM

The input necessary to run Tracy's case (see Table I) is given in Appendix D. The sequence numbers on the initial condition profiles are not required, they are included on the sample deck to aid in ordering the cards if they get mixed up.

The output from the program is presented in Appendix E. The solution has been printed at only a few mesh points.

After running much further along the cone the solution profiles obtained would be similar to those shown in Figures C-1, C-2, C-3, C-4, and C-5.

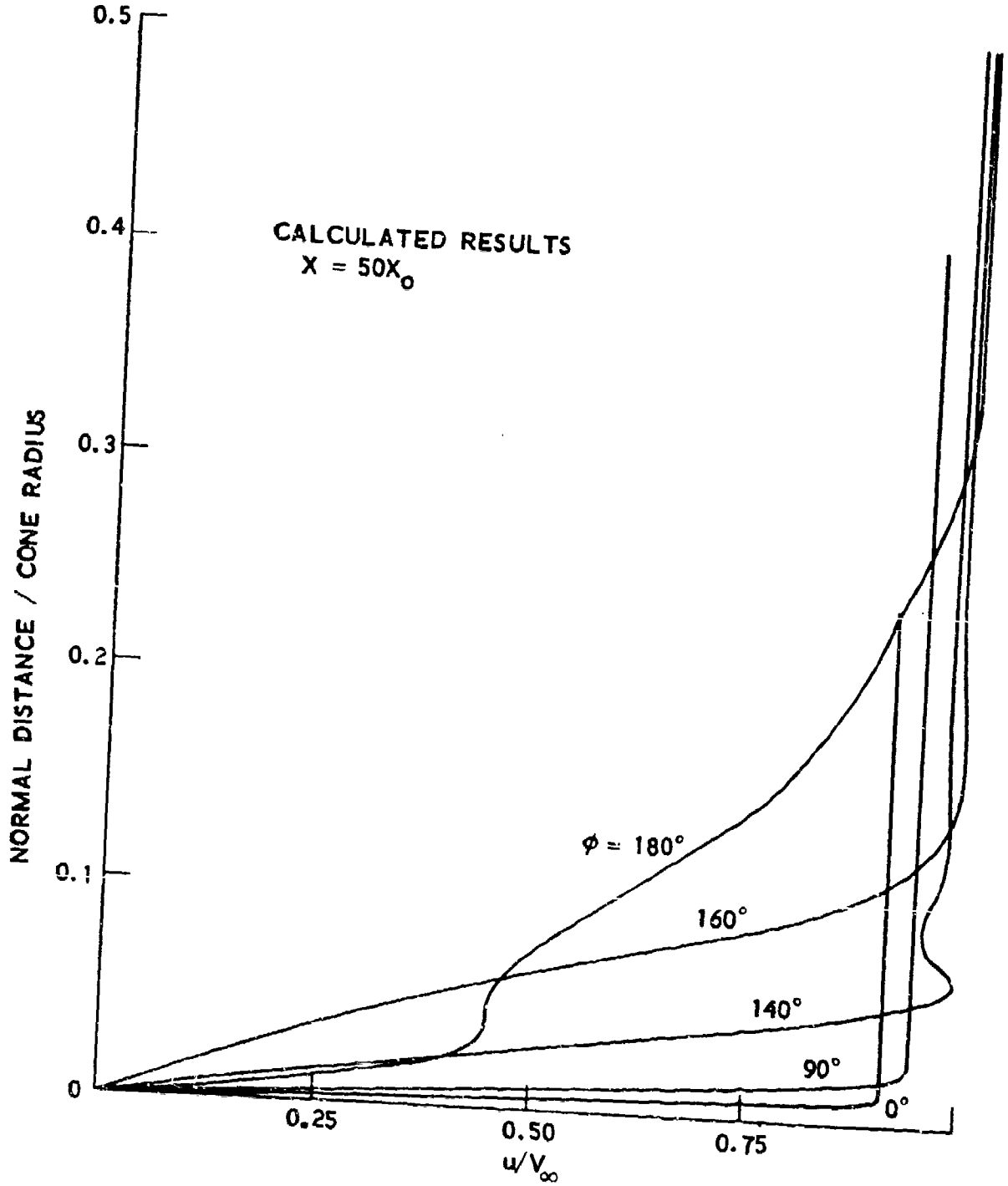


Figure C-1. Streamwise Velocity Profiles for Tracy's Case, $\alpha$ = 12 deg

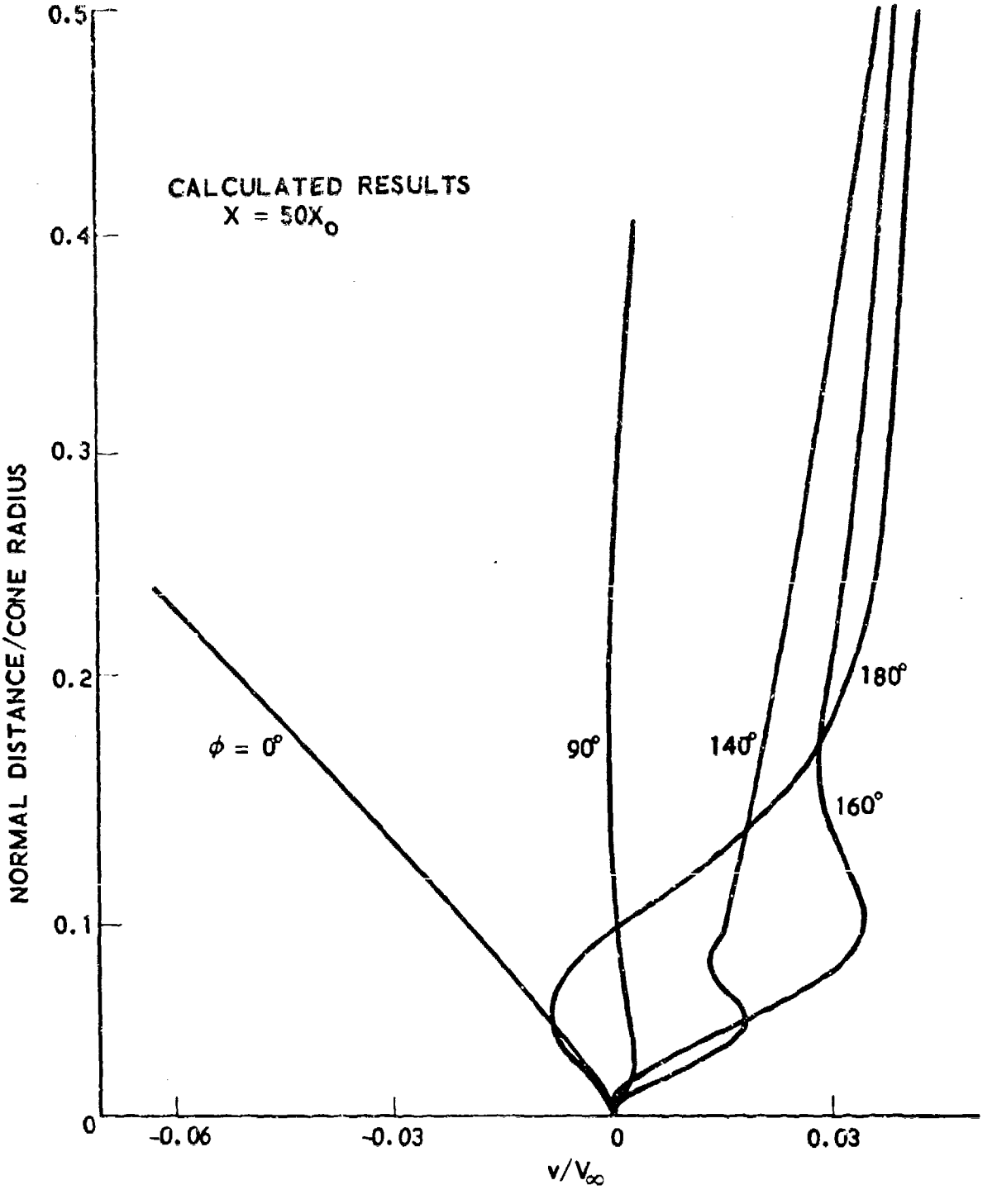


Figure C-2. Normal Velocity Profiles for Tracy's Case, $\alpha$ = 12 deg

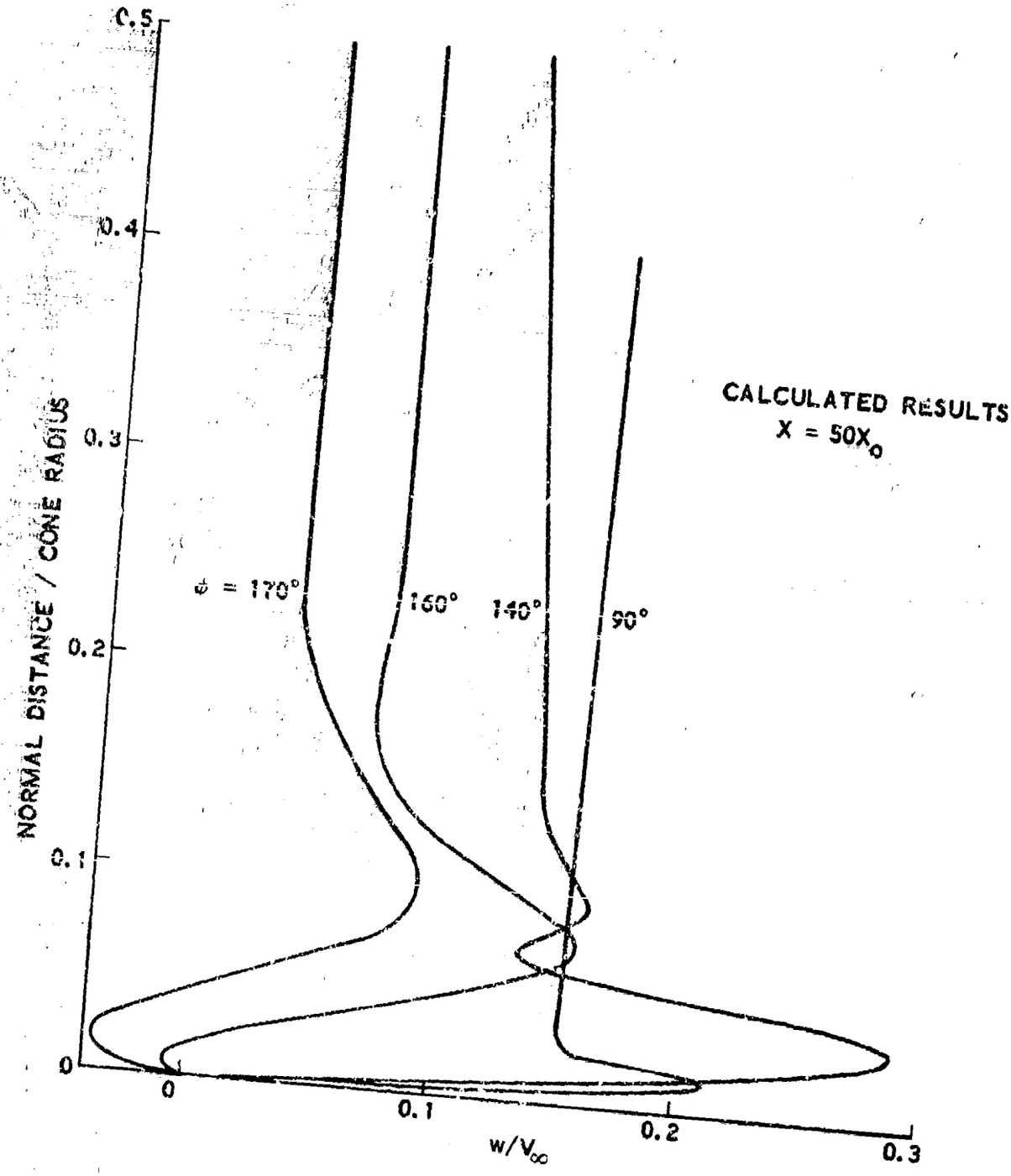


Figure C-3. Circumferential Velocity Profiles for Tracy's Case, $\alpha$ = 12 deg

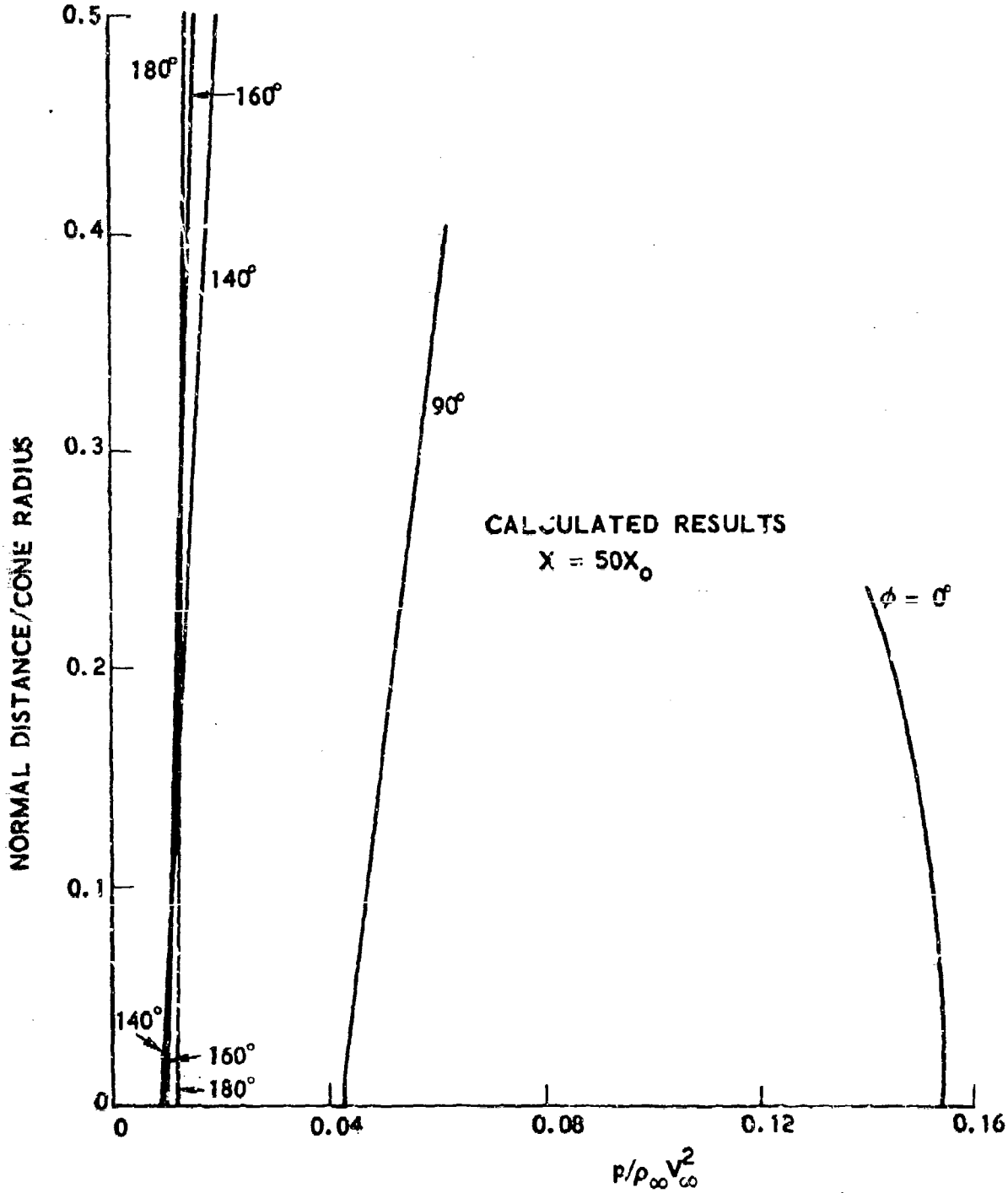


Figure C-4. Pressure Profiles for Tracy's Case. $\alpha$ = 12 deg

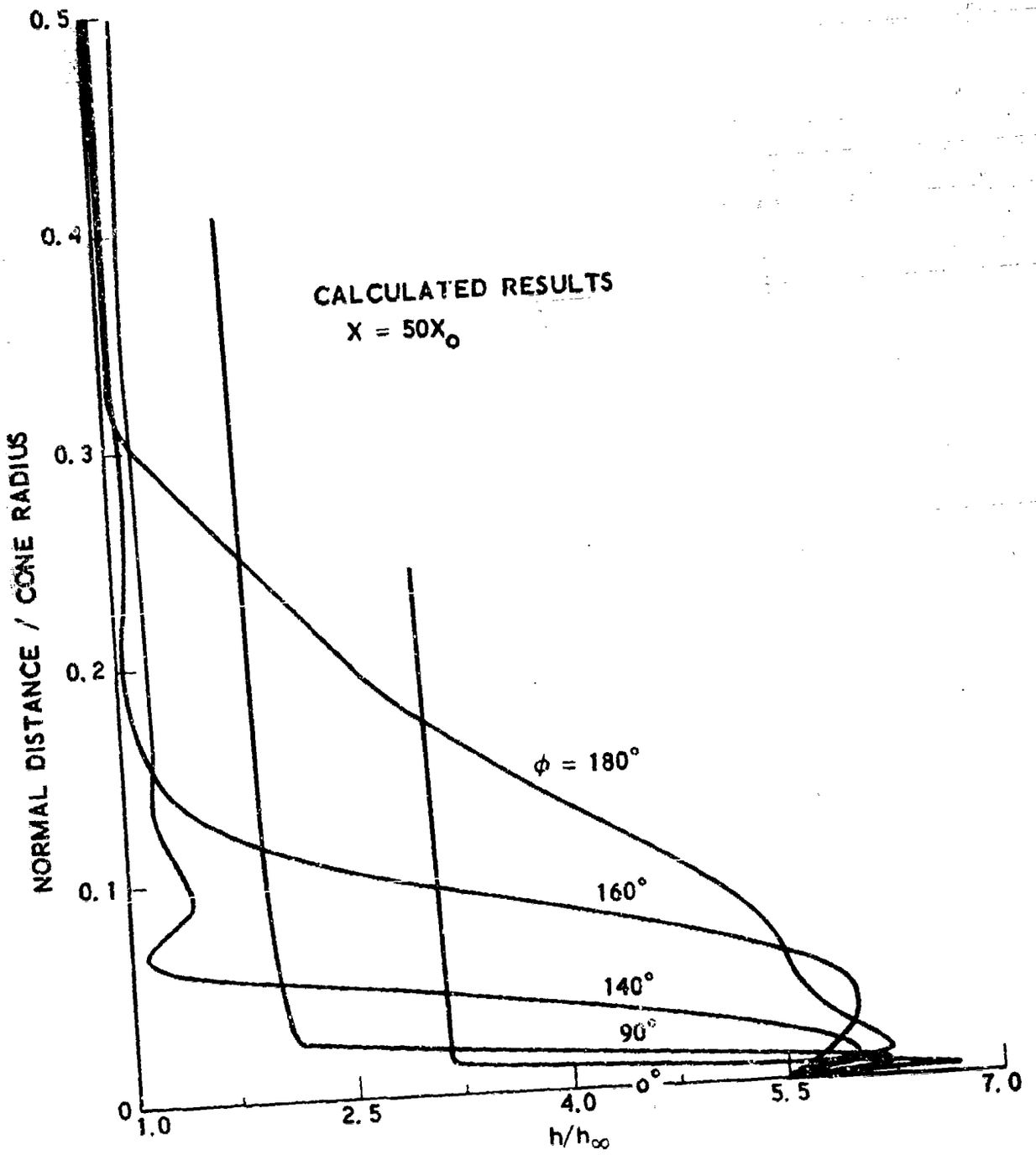


Figure C-5. Enthalpy Profiles for Tracy's Case, $\alpha$ = 12 deg

# APPENDIX D

# INPUT FOR TRACY'S CASE

```
1          12 ←Column→ 24          36          48          60          72
|          |           |           |           |           |           |
$INPUT
GAMMA=1.4,  MINF=8.0,
THETAC=10.      ,  REINF=1113000.,  PRINF=.75,
ALFA=12., PINF=.01116,  SPROP=2.,
NJ=11, NK=50,   NL=19,
$END
          0
0.          .18226E-02                                                  00010
0.          0.          0.          0.          .13899E+00  .55093E+01  00020
 .68366E-05  .16511E-01 -.10453E-04 -.65041E-68  .13897E+00  .56204E+01  00030
 .14357E-04  .34378E-01 -.45701E-04 -.13525E-67  .13895E+00  .57347E+01  00040
 .22561E-04  .53551E-01 -.11051E-03 -.21006E-67  .13893E+00  .58506E+01  00050
 .31619E-04  .74374E-01 -.21376E-03 -.29025E-67  .13890E+00  .59683E+01  00060
 .41703E-04  .97173E-01 -.36486E-03 -.37615E-67  .13888E+00  .60877E+01  00070
 .52813E-04  .12188E+00 -.57415E-03 -.46615E-67  .13885E+00  .62056E+01  00080
 .64948E-04  .14842E+00 -.85010E-03 -.55823E-67  .13883E+00  .63191E+01  00090
 .71613E-04  .16283E+00 -.10215E-02 -.60572E-67  .13881E+00  .63750E+01  00100
 .78279E-04  .17713E+00 -.12064E-02 -.65090E-67  .13880E+00  .64264E+01  00110
 .85628E-04  .19277E+00 -.14251E-02 -.69791E-67  .13878E+00  .64781E+01  00120
 .92978E-04  .20829E+00 -.16591E-02 -.74183E-67  .13877E+00  .65246E+01  00130
 .10921E-03  .24218E+00 -.22256E-02 -.82749E-67  .13873E+00  .66095E+01  00140
 .12716E-03  .27905E+00 -.29251E-02 -.90253E-67  .13872E+00  .66758E+01  00150
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 .16886E-03  .36269E+00 -.47895E-02 -.99173E-67  .13867E+00  .67248E+01  00170
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 .21945E-03  .46065E+00 -.73607E-02 -.93755E-67  .13864E+00  .65998E+01  00190
 .25039E-03  .51858E+00 -.90135E-02 -.82376E-67  .13864E+00  .64308E+01  00200
 .28440E-03  .58030E+00 -.10845E-01 -.64159E-67  .13867E+00  .61710E+01  00210
 .32200E-03  .64562E+00 -.12801E-01 -.39199E-67  .13870E+00  .58025E+01  00220
 .36336E-03  .71305E+00 -.14305E-01 -.94423E-68  .13877E+00  .53154E+01  00230
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 .45805E-03  .84234E+00 -.18413E-01  .44132E-67  .13895E+00  .40278E+01  00250
 .51257E-03  .89485E+00 -.19914E-01  .53112E-67  .13901E+00  .33245E+01  00260
 .57256E-03  .93053E+00 -.21556E-01  .43963E-67  .13901E+00  .27343E+01  00270
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 .77561E-03  .94591E+00 -.30499E-01  .74311E-68  .13811E+00  .23284E+01  00300
 .84415E-03  .94419E+00 -.34437E-01  .59732E-68  .13752E+00  .23698E+01  00310
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 .11861E-02  .93723E+00 -.54438E-01  .26543E-68  .13300E+00  .25181E+01  00360
 .12545E-02  .93583E+00 -.58558E-01  .22180E-68  .13180E+00  .25457E+01  00370
```

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| .15929E-02 | .92915E+00 | -.79099E-01 | .28880E-69 | .12453E+00 | .26693E+01 | 00430 |
| .16322E-02 | .92846E+00 | -.81465E-01 | .19453E-69 | .12356E+00 | .26810E+01 | 00440 |
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| .17799E-02 | .92628E+00 | -.90485E-01 | .30048E-70 | .11930E+00 | .27129E+01 | 00490 |
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| .78166E-03 | .94638E+00 | -.30136E-01 | .11940E-01 | .13611E+00 | .23153E+01 | 00810 |

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| .98870E-03 | .94180E+00 | -.41856E-01 | .16551E-01 | .13408E+00 | .24185E+01 | 00840 |
| .10576E-02 | .94043E+00 | -.45802E-01 | .17968E-01 | .13321E+00 | .24473E+01 | 00850 |
| .11265E-02 | .93906E+00 | -.49822E-01 | .19346E-01 | .13224E+00 | .24751E+01 | 00860 |
| .11954E-02 | .93767E+00 | -.53828E-01 | .20691E-01 | .13120E+00 | .25026E+01 | 00870 |
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| .14607E-02 | .93234E+00 | -.69529E-01 | .25634E-01 | .12631E+00 | .26030E+01 | 00910 |
| .15141E-02 | .93130E+00 | -.72734E-01 | .26579E-01 | .12513E+00 | .26214E+01 | 00920 |
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| .16053E-02 | .92960E+00 | -.78181E-01 | .28126E-01 | .12301E+00 | .26504E+01 | 00940 |
| .16450E-02 | .92890E+00 | -.80513E-01 | .28758E-01 | .12207E+00 | .26618E+01 | 00950 |
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| .17431E-02 | .92735E+00 | -.86389E-01 | .30144E-01 | .11941E+00 | .26850E+01 | 00980 |
| .17697E-02 | .92700E+00 | -.87888E-01 | .30448E-01 | .11876E+00 | .26897E+01 | 00990 |
| .17938E-02 | .92671E+00 | -.89415E-01 | .30692E-01 | .11793E+00 | .26929E+01 | 01000 |
| .18162E-02 | .92648E+00 | -.90564E-01 | .30875E-01 | .11749E+00 | .26956E+01 | 01010 |
| .18368E-02 | .92630E+00 | -.92077E-01 | .31014E-01 | .11647E+00 | .26963E+01 | 01020 |
| .20000E+02 | .18783E-02 | | | | | 01030 |
| 0. | 0. | 0. | 0. | .13093E+00 | .55093E+01 | 01040 |
| .70454E-05 | .16254E-01 | -.96149E-05 | .20460E-02 | .13091E+00 | .56181E+01 | 01050 |
| .14795E-04 | .33847E-01 | -.42100E-04 | .41882E-02 | .13090E+00 | .57301E+01 | 01060 |
| .23250E-04 | .52730E-01 | -.10189E-03 | .64024E-02 | .13088E+00 | .58435E+01 | 01070 |
| .32585E-04 | .73246E-01 | -.19726E-03 | .87066E-02 | .13086E+00 | .59589E+01 | 01080 |
| .42977E-04 | .95713E-01 | -.33698E-03 | .11107E-01 | .13084E+00 | .60759E+01 | 01090 |
| .54425E-04 | .12006E+00 | -.53078E-03 | .13563E-01 | .13081E+00 | .61915E+01 | 01100 |
| .66931E-04 | .14624E+00 | -.78666E-03 | .16032E-01 | .13079E+00 | .63028E+01 | 01110 |
| .73800E-04 | .16045E+00 | -.94574E-03 | .17298E-01 | .13078E+00 | .63577E+01 | 01120 |
| .80670E-04 | .17455E+00 | -.11175E-02 | .18503E-01 | .13077E+00 | .64082E+01 | 01130 |
| .88243E-04 | .18998E+00 | -.13210E-02 | .19761E-01 | .13075E+00 | .64590E+01 | 01140 |
| .95817E-04 | .20528E+00 | -.15387E-02 | .20950E-01 | .13074E+00 | .65048E+01 | 01150 |
| .11255E-03 | .23872E+00 | -.20667E-02 | .23332E-01 | .13071E+00 | .65885E+01 | 01160 |
| .13104E-03 | .27511E+00 | -.27201E-02 | .25599E-01 | .13069E+00 | .66543E+01 | 01170 |
| .15148E-03 | .31470E+00 | -.35141E-02 | .27688E-01 | .13066E+00 | .66959E+01 | 01180 |
| .17402E-03 | .35771E+00 | -.44685E-02 | .29520E-01 | .13066E+00 | .67054E+01 | 01190 |
| .19886E-03 | .40429E+00 | -.55917E-02 | .31006E-01 | .13064E+00 | .66731E+01 | 01200 |
| .22616E-03 | .45456E+00 | -.68966E-02 | .32051E-01 | .13065E+00 | .65883E+01 | 01210 |
| .25804E-03 | .51194E+00 | -.84684E-02 | .32564E-01 | .13065E+00 | .64268E+01 | 01220 |
| .29309E-03 | .57317E+00 | -.10221E-01 | .32355E-01 | .13069E+00 | .61768E+01 | 01230 |
| .33184E-03 | .63816E+00 | -.12108E-01 | .31323E-01 | .13073E+00 | .58204E+01 | 01240 |
| .37446E-03 | .70553E+00 | -.14060E-01 | .29420E-01 | .13081E+00 | .53462E+01 | 01250 |

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|---|---|---|---|---|---|---|
| .42096E-03 | .77267E+00 | -.15931E-01 | .26722E-01 | .13089E+00 | .47578E+01 | 01260 |
| .47204E-03 | .83636E+00 | -.17630E-01 | .23469E-01 | .13100E+00 | .40745E+01 | 01270 |
| .52823E-03 | .89085E+00 | -.19110E-01 | .20239E-01 | .13109E+00 | .33625E+01 | 01280 |
| .59005E-03 | .92909E+00 | -.20666E-01 | .18015E-01 | .13112E+00 | .27470E+01 | 01290 |
| .65804E-03 | .94738E+00 | -.22834E-01 | .17839E-01 | .13103E+00 | .23642E+01 | 01300 |
| .72867E-03 | .95010E+00 | -.25679E-01 | .19917E-01 | .13083E+00 | .22516E+01 | 01310 |
| .79930E-03 | .94773E+00 | -.29100E-01 | .23133E-01 | .13041E+00 | .22781E+01 | 01320 |
| .86993E-03 | .94593E+00 | -.32889E-01 | .26367E-01 | .12991E+00 | .23188E+01 | 01330 |
| .94056E-03 | .94455E+00 | -.36635E-01 | .29422E-01 | .12930E+00 | .23495E+01 | 01340 |
| .10110E-02 | .94311E+00 | -.40454E-01 | .32374E-01 | .12860E+00 | .23779E+01 | 01350 |
| .10815E-02 | .94174E+00 | -.44266E-01 | .35220E-01 | .12782E+00 | .24051E+01 | 01360 |
| .11519E-02 | .94037E+00 | -.48146E-01 | .37983E-01 | .12695E+00 | .24314E+01 | 01370 |
| .12224E-02 | .93899E+00 | -.52006E-01 | .40678E-01 | .12602E+00 | .24572E+01 | 01380 |
| .12928E-02 | .93760E+00 | -.55928E-01 | .43318E-01 | .12497E+00 | .24825E+01 | 01390 |
| .13633E-02 | .93621E+00 | -.59821E-01 | .45902E-01 | .12389E+00 | .25074E+01 | 01400 |
| .14320E-02 | .93485E+00 | -.63675E-01 | .48376E-01 | .12270E+00 | .25309E+01 | 01410 |
| .14936E-02 | .93365E+00 | -.67094E-01 | .50547E-01 | .12162E+00 | .25513E+01 | 01420 |
| .15482E-02 | .93261E+00 | -.70169E-01 | .52432E-01 | .12055E+00 | .25685E+01 | 01430 |
| .15975E-02 | .93168E+00 | -.72900E-01 | .54086E-01 | .11959E+00 | .25834E+01 | 01440 |
| .16416E-02 | .93088E+00 | -.75384E-01 | .55518E-01 | .11863E+00 | .25958E+01 | 01450 |
| .16821E-02 | .93018E+00 | -.77612E-01 | .56779E-01 | .11778E+00 | .26064E+01 | 01460 |
| .17191E-02 | .92956E+00 | -.79707E-01 | .57872E-01 | .11688E+00 | .26153E+01 | 01470 |
| .17525E-02 | .92904E+00 | -.81523E-01 | .58791E-01 | .11615E+00 | .26225E+01 | 01480 |
| .17825E-02 | .92861E+00 | -.83239E-01 | .59547E-01 | .11534E+00 | .26280E+01 | 01490 |
| .18096E-02 | .92826E+00 | -.84667E-01 | .60153E-01 | .11476E+00 | .26325E+01 | 01500 |
| .18343E-02 | .92797E+00 | -.86141E-01 | .60637E-01 | .11397E+00 | .26355E+01 | 01510 |
| .18572E-02 | .92775E+00 | -.87226E-01 | .60996E-01 | .11359E+00 | .26378E+01 | 01520 |
| .18783E-02 | .92757E+00 | -.88706E-01 | .61267E-01 | .11262E+00 | .26382E+01 | 01530 |
| .30000E+02 | .19473E-02 | | | | | 01540 |
| 0. | 0. | 0. | 0. | .12185E+00 | .55093E+01 | 01550 |
| .73043E-05 | .16039E-01 | -.86570E-05 | .29861E-02 | .12184E+00 | .56159E+01 | 01560 |
| .15339E-04 | .33405E-01 | -.37989E-04 | .61136E-02 | .12182E+00 | .57256E+01 | 01570 |
| .24104E-04 | .52049E-01 | -.92055E-04 | .93473E-02 | .12180E+00 | .58368E+01 | 01580 |
| .33782E-04 | .72310E-01 | -.17845E-03 | .12714E-01 | .12178E+00 | .59498E+01 | 01590 |
| .44556E-04 | .94503E-01 | -.30525E-03 | .16222E-01 | .12177E+00 | .60642E+01 | 01600 |
| .56426E-04 | .11856E+00 | -.48145E-03 | .19812E-01 | .12174E+00 | .61773E+01 | 01610 |
| .69391E-04 | .14443E+00 | -.71457E-03 | .23423E-01 | .12173E+00 | .62862E+01 | 01620 |
| .76512E-04 | .15848E+00 | -.85975E-03 | .25276E-01 | .12172E+00 | .63399E+01 | 01630 |
| .83634E-04 | .17242E+00 | -.10167E-02 | .27039E-01 | .12171E+00 | .63893E+01 | 01640 |
| .91486E-04 | .18767E+00 | -.12028E-02 | .28881E-01 | .12170E+00 | .64390E+01 | 01650 |
| .99338E-04 | .20271E+00 | -.14021E-02 | .30621E-01 | .12169E+00 | .64838E+01 | 01660 |
| .11669E-03 | .23587E+00 | -.18865E-02 | .34111E-01 | .12166E+00 | .65657E+01 | 01670 |
| .13586E-03 | .27187E+00 | -.24877E-02 | .37437E-01 | .12165E+00 | .66303E+01 | 01680 |
| .15704E-03 | .31105E+00 | -.32204E-02 | .40504E-01 | .12163E+00 | .66713E+01 | 01690 |

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|---|---|---|---|---|---|---|
| .18042E-03 | .35362E+00 | -.41044E-02 | .43199E-01 | .12163E+00 | .66811E+01 | 01700 |
| .20616E-03 | .39976E+00 | -.51486E-02 | .45393E-01 | .12162E+00 | .66505E+01 | 01710 |
| .23447E-03 | .44957E+00 | -.63675E-02 | .46946E-01 | .12163E+00 | .65689E+01 | 01720 |
| .26752E-03 | .50649E+00 | -.78435E-02 | .47728E-01 | .12164E+00 | .64128E+01 | 01730 |
| .30386E-03 | .56731E+00 | -.94997E-02 | .47456E-01 | .12169E+00 | .61703E+01 | 01740 |
| .34403E-03 | .63201E+00 | -.11297E-01 | .45979E-01 | .12174E+00 | .58236E+01 | 01750 |
| .38822E-03 | .69933E+00 | -.13172E-01 | .43216E-01 | .12182E+00 | .53604E+01 | 01760 |
| .43643E-03 | .76679E+00 | -.14988E-01 | .39261E-01 | .12192E+00 | .47819E+01 | 01770 |
| .48939E-03 | .83141E+00 | -.16649E-01 | .34428E-01 | .12203E+00 | .41034E+01 | 01780 |
| .54764E-03 | .88760E+00 | -.18082E-01 | .29517E-01 | .12213E+00 | .33852E+01 | 01790 |
| .61173E-03 | .92811E+00 | -.19537E-01 | .25944E-01 | .12218E+00 | .27482E+01 | 01800 |
| .68222E-03 | .94844E+00 | -.21546E-01 | .25307E-01 | .12214E+00 | .23353E+01 | 01810 |
| .75544E-03 | .95216E+00 | -.24199E-01 | .28085E-01 | .12200E+00 | .22007E+01 | 01820 |
| .82867E-03 | .94987E+00 | -.27388E-01 | .32756E-01 | .12166E+00 | .22198E+01 | 01830 |
| .90190E-03 | .94801E+00 | -.30977E-01 | .37561E-01 | .12125E+00 | .22592E+01 | 01840 |
| .97512E-03 | .94666E+00 | -.34513E-01 | .42102E-01 | .12074E+00 | .22878E+01 | 01850 |
| .10482E-02 | .94523E+00 | -.38105E-01 | .46499E-01 | .12016E+00 | .23140E+01 | 01860 |
| .11212E-02 | .94385E+00 | -.41684E-01 | .50740E-01 | .11952E+00 | .23389E+01 | 01870 |
| .11942E-02 | .94249E+00 | -.45318E-01 | .54861E-01 | .11878E+00 | .23628E+01 | 01880 |
| .12673E-02 | .94111E+00 | -.48926E-01 | .58877E-01 | .11802E+00 | .23861E+01 | 01890 |
| .13403E-02 | .93972E+00 | -.52584E-01 | .62814E-01 | .11714E+00 | .24090E+01 | 01900 |
| .14134E-02 | .93832E+00 | -.56206E-01 | .66666E-01 | .11625E+00 | .24315E+01 | 01910 |
| .14846E-02 | .93696E+00 | -.59788E-01 | .70360E-01 | .11524E+00 | .24527E+01 | 01920 |
| .15485E-02 | .93574E+00 | -.62955E-01 | .73602E-01 | .11435E+00 | .24711E+01 | 01930 |
| .16051E-02 | .93468E+00 | -.65804E-01 | .76420E-01 | .11344E+00 | .24865E+01 | 01940 |
| .16562E-02 | .93374E+00 | -.68325E-01 | .78897E-01 | .11264E+00 | .24999E+01 | 01950 |
| .17019E-02 | .93293E+00 | -.70623E-01 | .81047E-01 | .11182E+00 | .25110E+01 | 01960 |
| .17439E-02 | .93221E+00 | -.72673E-01 | .82941E-01 | .11111E+00 | .25206E+01 | 01970 |
| .17822E-02 | .93158E+00 | -.74612E-01 | .84587E-01 | .11034E+00 | .25284E+01 | 01980 |
| .18169E-02 | .93105E+00 | -.76279E-01 | .85970E-01 | .10973E+00 | .25349E+01 | 01990 |
| .18480E-02 | .93061E+00 | -.77873E-01 | .87108E-01 | .10903E+00 | .25397E+01 | 02000 |
| .18761E-02 | .93026E+00 | -.79178E-01 | .88018E-01 | .10854E+00 | .25436E+01 | 02010 |
| .19017E-02 | .92997E+00 | -.80562E-01 | .88742E-01 | .10784E+00 | .25460E+01 | 02020 |
| .19254E-02 | .92975E+00 | -.81538E-01 | .89272E-01 | .10755E+00 | .25481E+01 | 02030 |
| .19473E-02 | .92959E+00 | -.82962E-01 | .89665E-01 | .10664E+00 | .25481E+01 | 02040 |
| .40000E+02 | .20456E-02 | | | | | 02050 |
| 0. | 0. | 0. | 0. | .11053E+00 | .55093E+01 | 02060 |
| .76731E-05 | .15735E-01 | -.72549E-05 | .38374E-02 | .11052E+00 | .56129E+01 | 02070 |
| .16113E-04 | .32777E-01 | -.31952E-04 | .78583E-02 | .11051E+00 | .57195E+01 | 02080 |
| .25321E-04 | .51080E-01 | -.77603E-04 | .12018E-01 | .11049E+00 | .58274E+01 | 02090 |
| .35488E-04 | .70976E-01 | -.15079E-03 | .16350E-01 | .11048E+00 | .59370E+01 | 02100 |
| .46806E-04 | .92779E-01 | -.25853E-03 | .20867E-01 | .11047E+00 | .60481E+01 | 02110 |
| .59274E-04 | .11642E+00 | -.40878E-03 | .25492E-01 | .11045E+00 | .61578E+01 | 02120 |
| .72894E-04 | .14185E+00 | -.60827E-03 | .30146E-01 | .11044E+00 | .62635E+01 | 02130 |

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|---|---|---|---|---|---|---|
| .80375E-04 | .15566E+00 | -.73287E-03 | .32535E-01 | .11043E+00 | .63155E+01 | 02140 |
| .87857E-04 | .16937E+00 | -.86785E-03 | .34810E-01 | .11042E+00 | .63634E+01 | 02150 |
| .96105E-04 | .18437E+00 | -.10282E-02 | .37188E-01 | .11041E+00 | .64116E+01 | 02160 |
| .10435E-03 | .19926E+00 | -.12004E-02 | .39435E-01 | .11040E+00 | .64551E+01 | 02170 |
| .12258E-03 | .23179E+00 | -.16200E-02 | .43945E-01 | .11039E+00 | .65347E+01 | 02180 |
| .14272E-03 | .26722E+00 | -.21434E-02 | .48249E-01 | .11038E+00 | .65977E+01 | 02190 |
| .16497E-03 | .30580E+00 | -.27847E-02 | .52224E-01 | .11037E+00 | .66381E+01 | 02200 |
| .18952E-03 | .34773E+00 | -.35629E-02 | .55728E-01 | .11037E+00 | .66486E+01 | 02210 |
| .21657E-03 | .39321E+00 | -.44884E-02 | .58593E-01 | .11037E+00 | .66206E+01 | 02220 |
| .24631E-03 | .44235E+00 | -.55766E-02 | .60640E-01 | .11039E+00 | .65436E+01 | 02230 |
| .28103E-03 | .49856E+00 | -.69060E-02 | .61704E-01 | .11041E+00 | .63953E+01 | 02240 |
| .31920E-03 | .55875E+00 | -.84131E-02 | .61415E-01 | .11047E+00 | .61639E+01 | 02250 |
| .36140E-03 | .62297E+00 | -.10068E-01 | .59572E-01 | .11052E+00 | .58314E+01 | 02260 |
| .40782E-03 | .69011E+00 | -.11820E-01 | .56055E-01 | .11061E+00 | .53845E+01 | 02270 |
| .45847E-03 | .75790E+00 | -.13542E-01 | .50951E-01 | .11071E+00 | .48215E+01 | 02280 |
| .51410E-03 | .82369E+00 | -.15137E-01 | .44604E-01 | .11084E+00 | .41522E+01 | 02290 |
| .57529E-03 | .88218E+00 | -.16505E-01 | .37955E-01 | .11095E+00 | .34280E+01 | 02300 |
| .64262E-03 | .92598E+00 | -.17823E-01 | .32774E-01 | .11103E+00 | .27627E+01 | 02310 |
| .71667E-03 | .94546E+00 | -.19607E-01 | .31228E-01 | .11102E+00 | .23062E+01 | 02320 |
| .79359E-03 | .95483E+00 | -.21998E-01 | .34260E-01 | .11095E+00 | .21371E+01 | 02330 |
| .87051E-03 | .95276E+00 | -.24860E-01 | .40146E-01 | .11072E+00 | .21441E+01 | 02340 |
| .94743E-03 | .95080E+00 | -.28162E-01 | .46453E-01 | .11040E+00 | .21820E+01 | 02350 |
| .10244E-02 | .94949E+00 | -.31408E-01 | .52418E-01 | .11002E+00 | .22082E+01 | 02360 |
| .11011E-02 | .94807E+00 | -.34679E-01 | .58212E-01 | .10957E+00 | .22315E+01 | 02370 |
| .11778E-02 | .94670E+00 | -.37934E-01 | .63809E-01 | .10909E+00 | .22536E+01 | 02380 |
| .12545E-02 | .94535E+00 | -.41224E-01 | .69248E-01 | .10852E+00 | .22745E+01 | 02390 |
| .13313E-02 | .94397E+00 | -.44483E-01 | .74553E-01 | .10795E+00 | .22948E+01 | 02400 |
| .14080E-02 | .94258E+00 | -.47774E-01 | .79759E-01 | .10726E+00 | .23146E+01 | 02410 |
| .14847E-02 | .94118E+00 | -.51022E-01 | .84857E-01 | .10660E+00 | .23340E+01 | 02420 |
| .15596E-02 | .93980E+00 | -.54230E-01 | .89752E-01 | .10581E+00 | .23522E+01 | 02430 |
| .16267E-02 | .93857E+00 | -.57051E-01 | .94055E-01 | .10514E+00 | .23680E+01 | 02440 |
| .16862E-02 | .93748E+00 | -.59593E-01 | .97804E-01 | .10443E+00 | .23812E+01 | 02450 |
| .17399E-02 | .93652E+00 | -.61825E-01 | .10110E+00 | .10383E+00 | .23927E+01 | 02460 |
| .17878E-02 | .93568E+00 | -.63872E-01 | .10398E+00 | .10318E+00 | .24021E+01 | 02470 |
| .18319E-02 | .93494E+00 | -.65680E-01 | .10651E+00 | .10264E+00 | .24103E+01 | 02480 |
| .18722E-02 | .93429E+00 | -.67409E-01 | .10872E+00 | .10202E+00 | .24169E+01 | 02490 |
| .19087E-02 | .93374E+00 | -.68873E-01 | .11058E+00 | .10155E+00 | .24224E+01 | 02500 |
| .19413E-02 | .93329E+00 | -.70305E-01 | .11211E+00 | .10097E+00 | .24264E+01 | 02510 |
| .19708E-02 | .93292E+00 | -.71445E-01 | .11332E+00 | .10061E+00 | .24297E+01 | 02520 |
| .19977E-02 | .93264E+00 | -.72710E-01 | .11429E+00 | .10001E+00 | .24314E+01 | 02530 |
| .20226E-02 | .93241E+00 | -.73541E-01 | .11498E+00 | .99834E-01 | .24332E+01 | 02540 |
| .20456E-02 | .93227E+00 | -.74895E-01 | .11548E+00 | .98998E-01 | .24327E+01 | 02550 |
| .50000E+02 | .21729E-02 | | | | | 02560 |
| 0. | 0. | 0. | 0. | .98121E-01 | .55093E+01 | 02570 |

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|---|---|---|---|---|---|---|
| .81503E-05 | .15352E-01 | -.54128E-05 | .45555E-02 | .98114E-01 | .56092E+01 | 02580 |
| .17116E-04 | .31586E-01 | -.23987E-04 | .93316E-02 | .98104E-01 | .57118E+01 | 02590 |
| .26896E-04 | .49859E-01 | -.58521E-04 | .14275E-01 | .98096E-01 | .58158E+01 | 02600 |
| .37695E-04 | .69297E-01 | -.11422E-03 | .19428E-01 | .98084E-01 | .59213E+01 | 02610 |
| .49717E-04 | .90604E-01 | -.19671E-03 | .24804E-01 | .98076E-01 | .60283E+01 | 02620 |
| .62961E-04 | .11372E+00 | -.31249E-03 | .30313E-01 | .98062E-01 | .61339E+01 | 02630 |
| .77428E-04 | .13859E+00 | -.46725E-03 | .35862E-01 | .98055E-01 | .62356E+01 | 02640 |
| .85374E-04 | .15210E+00 | -.56445E-03 | .38712E-01 | .98049E-01 | .62857E+01 | 02650 |
| .93321E-04 | .16551E+00 | -.67012E-03 | .41427E-01 | .98045E-01 | .63318E+01 | 02660 |
| .10208E-03 | .18020E+00 | -.79610E-03 | .44268E-01 | .98039E-01 | .63783E+01 | 02670 |
| .11084E-03 | .19477E+00 | -.93193E-03 | .46952E-01 | .98036E-01 | .64202E+01 | 02680 |
| .13020E-03 | .22662E+00 | -.12649E-02 | .52349E-01 | .98025E-01 | .64971E+01 | 02690 |
| .15160E-03 | .26132E+00 | -.16836E-02 | .57508E-01 | .98026E-01 | .65583E+01 | 02700 |
| .17523E-03 | .29912E+00 | -.22015E-02 | .62286E-01 | .98021E-01 | .65981E+01 | 02710 |
| .20131E-03 | .34023E+00 | -.28363E-02 | .66513E-01 | .98033E-01 | .66098E+01 | 02720 |
| .23004E-03 | .38485E+00 | -.35995E-02 | .69994E-01 | .98041E-01 | .65849E+01 | 02730 |
| .26162E-03 | .43311E+00 | -.45076E-02 | .72512E-01 | .98069E-01 | .65139E+01 | 02740 |
| .29850E-03 | .48839E+00 | -.56319E-02 | .73880E-01 | .98099E-01 | .63756E+01 | 02750 |
| .33905E-03 | .54772E+00 | -.69262E-02 | .73647E-01 | .98155E-01 | .61581E+01 | 02760 |
| .38388E-03 | .61124E+00 | -.83726E-02 | .71567E-01 | .98219E-01 | .58437E+01 | 02770 |
| .43319E-03 | .67801E+00 | -.99326E-02 | .67472E-01 | .98310E-01 | .54180E+01 | 02780 |
| .48698E-03 | .74606E+00 | -.11499E-01 | .61421E-01 | .98413E-01 | .48760E+01 | 02790 |
| .54607E-03 | .81309E+00 | -.12977E-01 | .53740E-01 | .98535E-01 | .42214E+01 | 02800 |
| .61107E-03 | .87429E+00 | -.14240E-01 | .45408E-01 | .98658E-01 | .34943E+01 | 02810 |
| .68259E-03 | .92224E+00 | -.15378E-01 | .38416E-01 | .98753E-01 | .27970E+01 | 02820 |
| .76124E-03 | .95002E+00 | -.16863E-01 | .35470E-01 | .98788E-01 | .22852E+01 | 02830 |
| .84294E-03 | .95788E+00 | -.18932E-01 | .38177E-01 | .98776E-01 | .20683E+01 | 02840 |
| .92465E-03 | .95628E+00 | -.21389E-01 | .44899E-01 | .98645E-01 | .20562E+01 | 02850 |
| .10064E-02 | .95418E+00 | -.24314E-01 | .52587E-01 | .98418E-01 | .20921E+01 | 02860 |
| .10881E-02 | .95291E+00 | -.27202E-01 | .59893E-01 | .98174E-01 | .21160E+01 | 02870 |
| .11696E-02 | .95153E+00 | -.30062E-01 | .67016E-01 | .97844E-01 | .21359E+01 | 02880 |
| .12511E-02 | .95017E+00 | -.32910E-01 | .73918E-01 | .97526E-01 | .21549E+01 | 02890 |
| .13326E-02 | .94883E+00 | -.35762E-01 | .80627E-01 | .97115E-01 | .21725E+01 | 02900 |
| .14141E-02 | .94746E+00 | -.38581E-01 | .87174E-01 | .96734E-01 | .21894E+01 | 02910 |
| .14956E-02 | .94608E+00 | -.41412E-01 | .93607E-01 | .96246E-01 | .22058E+01 | 02920 |
| .15771E-02 | .94466E+00 | -.44191E-01 | .99913E-01 | .95802E-01 | .22217E+01 | 02930 |
| .16565E-02 | .94327E+00 | -.46930E-01 | .10598E+00 | .95243E-01 | .22366E+01 | 02940 |
| .17279E-02 | .94201E+00 | -.49318E-01 | .11131E+00 | .94793E-01 | .22496E+01 | 02950 |
| .17910E-02 | .94090E+00 | -.51477E-01 | .11598E+00 | .94282E-01 | .22603E+01 | 02960 |
| .18481E-02 | .93991E+00 | -.53352E-01 | .12009E+00 | .93876E-01 | .22696E+01 | 02970 |
| .18990E-02 | .93903E+00 | -.55085E-01 | .12368E+00 | .93403E-01 | .22773E+01 | 02980 |
| .19459E-02 | .93825E+00 | -.56593E-01 | .12685E+00 | .93039E-01 | .22839E+01 | 02990 |
| .19887E-02 | .93757E+00 | -.58064E-01 | .12963E+00 | .92575E-01 | .22892E+01 | 03000 |
| .20274E-02 | .93700E+00 | -.59278E-01 | .13197E+00 | .92264E-01 | .22936E+01 | 03010 |

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|---|---|---|---|---|---|---|
| .20620E-02 | .93652E+00 | -.60512E-01 | .13390E+00 | .91811E-01 | .22967E+01 | 03020 |
| .20934E-02 | .93614E+00 | -.61450E-01 | .13543E+00 | .91588E-01 | .22993E+01 | 03030 |
| .21219E-02 | .93584E+00 | -.62575E-01 | .13663E+00 | .91088E-01 | .23004E+01 | 03040 |
| .21484E-02 | .93562E+00 | -.63230E-01 | .13748E+00 | .91038E-01 | .23018E+01 | 03050 |
| .21729E-02 | .93549E+00 | -.64506E-01 | .13808E+00 | .90285E-01 | .23009E+01 | 03060 |
| .60000E+02 | .23293E-02 | | | | | 03070 |
| 0. | 0. | 0. | 0. | .85637E-01 | .55093E+01 | 03080 |
| .87369E-05 | .14919E-01 | -.31920E-05 | .51160E-02 | .85633E-01 | .56049E+01 | 03090 |
| .18347E-04 | .31092E-01 | -.14340E-04 | .10484E-01 | .85628E-01 | .57031E+01 | 03100 |
| .28832E-04 | .48479E-01 | -.35385E-04 | .16044E-01 | .85623E-01 | .58026E+01 | 03110 |
| .40408E-04 | .67396E-01 | -.69812E-04 | .21844E-01 | .85616E-01 | .59036E+01 | 03120 |
| .53295E-04 | .88143E-01 | -.12157E-03 | .27901E-01 | .85611E-01 | .60059E+01 | 03130 |
| .67492E-04 | .11066E+00 | -.19531E-03 | .34114E-01 | .85604E-01 | .61069E+01 | 03140 |
| .83000E-04 | .13489E+00 | -.29542E-03 | .40377E-01 | .85601E-01 | .62042E+01 | 03150 |
| .91519E-04 | .14806E+00 | -.35909E-03 | .43598E-01 | .85598E-01 | .62522E+01 | 03160 |
| .10004E-03 | .16114E+00 | -.42885E-03 | .46667E-01 | .85596E-01 | .62964E+01 | 03170 |
| .10943E-03 | .17546E+00 | -.51272E-03 | .49881E-01 | .85594E-01 | .63409E+01 | 03180 |
| .11882E-03 | .18967E+00 | -.60388E-03 | .52921E-01 | .85594E-01 | .63811E+01 | 03190 |
| .13957E-03 | .22074E+00 | -.83010E-03 | .59039E-01 | .85590E-01 | .64550E+01 | 03200 |
| .16251E-03 | .25460E+00 | -.11197E-02 | .64902E-01 | .85596E-01 | .65142E+01 | 03210 |
| .18784E-03 | .29150E+00 | -.14844E-02 | .70350E-01 | .85600E-01 | .65534E+01 | 03220 |
| .21580E-03 | .33166E+00 | -.19401E-02 | .75192E-01 | .85617E-01 | .65662E+01 | 03230 |
| .24660E-03 | .37527E+00 | -.24991E-02 | .79209E-01 | .85633E-01 | .65449E+01 | 03240 |
| .28045E-03 | .42249E+00 | -.31782E-02 | .82161E-01 | .85665E-01 | .64805E+01 | 03250 |
| .31999E-03 | .47666E+00 | -.40381E-02 | .83842E-01 | .85703E-01 | .63531E+01 | 03260 |
| .36345E-03 | .53492E+00 | -.50524E-02 | .83737E-01 | .85760E-01 | .61512E+01 | 03270 |
| .41151E-03 | .59754E+00 | -.62150E-02 | .81556E-01 | .85827E-01 | .58574E+01 | 03280 |
| .46436E-03 | .66373E+00 | -.75032E-02 | .77087E-01 | .85913E-01 | .54563E+01 | 03290 |
| .52203E-03 | .73182E+00 | -.88321E-02 | .70343E-01 | .86012E-01 | .49400E+01 | 03300 |
| .58537E-03 | .79997E+00 | -.10116E-01 | .61590E-01 | .86124E-01 | .43058E+01 | 03310 |
| .65505E-03 | .86393E+00 | -.11211E-01 | .51755E-01 | .86246E-01 | .35817E+01 | 03320 |
| .73171E-03 | .91654E+00 | -.12120E-01 | .42889E-01 | .86345E-01 | .28546E+01 | 03330 |
| .81602E-03 | .94963E+00 | -.13232E-01 | .38118E-01 | .86408E-01 | .22801E+01 | 03340 |
| .90361E-03 | .96095E+00 | -.14920E-01 | .39856E-01 | .86430E-01 | .20024E+01 | 03350 |
| .99120E-03 | .96026E+00 | -.16928E-01 | .46873E-01 | .86395E-01 | .19621E+01 | 03360 |
| .10788E-02 | .95800E+00 | -.19394E-01 | .55718E-01 | .86236E-01 | .19947E+01 | 03370 |
| .11664E-02 | .95678E+00 | -.21876E-01 | .64238E-01 | .86105E-01 | .20167E+01 | 03380 |
| .12537E-02 | .95547E+00 | -.24253E-01 | .72568E-01 | .85876E-01 | .20330E+01 | 03390 |
| .13411E-02 | .95412E+00 | -.26623E-01 | .80689E-01 | .85693E-01 | .20488E+01 | 03400 |
| .14285E-02 | .95281E+00 | -.28964E-01 | .88584E-01 | .85417E-01 | .20629E+01 | 03410 |
| .15158E-02 | .95146E+00 | -.31267E-01 | .96298E-01 | .85195E-01 | .20763E+01 | 03420 |
| .16032E-02 | .95008E+00 | -.33559E-01 | .10389E+00 | .84876E-01 | .20891E+01 | 03430 |
| .16906E-02 | .94867E+00 | -.35790E-01 | .11133E+00 | .84621E-01 | .21015E+01 | 03440 |
| .17758E-02 | .94726E+00 | -.37982E-01 | .11851E+00 | .84261E-01 | .21130E+01 | 03450 |

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|---|---|---|---|---|---|---|
| .18522E-02 | .94598E+00 | -.39867E-01 | .12484E+00 | .84006E-01 | .21229E+01 | 03460 |
| .19199E-02 | .94484E+00 | -.41580E-01 | .13037E+00 | .83678E-01 | .21311E+01 | 03470 |
| .19811E-02 | .94381E+00 | -.43038E-01 | .13527E+00 | .83448E-01 | .21382E+01 | 03480 |
| .20357E-02 | .94290E+00 | -.44410E-01 | .13957E+00 | .83138E-01 | .21439E+01 | 03490 |
| .20859E-02 | .94208E+00 | -.45569E-01 | .14337E+00 | .82935E-01 | .21489E+01 | 03500 |
| .21318E-02 | .94136E+00 | -.46741E-01 | .14672E+00 | .82619E-01 | .21527E+01 | 03510 |
| .21733E-02 | .94074E+00 | -.47666E-01 | .14954E+00 | .82454E-01 | .21561E+01 | 03520 |
| .22104E-02 | .94023E+00 | -.48673E-01 | .15187E+00 | .82126E-01 | .21582E+01 | 03530 |
| .22441E-02 | .93982E+00 | -.49378E-01 | .15372E+00 | .82031E-01 | .21601E+01 | 03540 |
| .22746E-02 | .93952E+00 | -.50344E-01 | .15517E+00 | .81632E-01 | .21607E+01 | 03550 |
| .23030E-02 | .93928E+00 | -.50798E-01 | .15616E+00 | .81703E-01 | .21618E+01 | 03560 |
| .23293E-02 | .93917E+00 | -.51994E-01 | .15685E+00 | .81031E-01 | .21605E+01 | 03570 |
| .70000E+02 | .25128E-02 | | | | | 03580 |
| 0. | 0. | 0. | 0. | .73900E-01 | .55093E+01 | 03590 |
| .94253E-05 | .14456E-01 | -.67854E-06 | .54922E-02 | .73899E-01 | .56003E+01 | 03600 |
| .19793E-04 | .30137E-01 | -.33595E-05 | .11260E-01 | .73897E-01 | .56938E+01 | 03610 |
| .31104E-04 | .47002E-01 | -.90235E-05 | .17239E-01 | .73896E-01 | .57885E+01 | 03620 |
| .43592E-04 | .65360E-01 | -.19136E-04 | .23482E-01 | .73894E-01 | .58847E+01 | 03630 |
| .57495E-04 | .85503E-01 | -.35711E-04 | .30008E-01 | .73893E-01 | .59820E+01 | 03640 |
| .72811E-04 | .10738E+00 | -.61235E-04 | .36710E-01 | .73891E-01 | .60782E+01 | 03650 |
| .89541E-04 | .13092E+00 | -.98515E-04 | .43474E-01 | .73892E-01 | .61709E+01 | 03660 |
| .98730E-04 | .14373E+00 | -.12356E-03 | .46956E-01 | .73892E-01 | .62166E+01 | 03670 |
| .10792E-03 | .15644E+00 | -.15192E-03 | .50276E-01 | .73892E-01 | .62588E+01 | 03680 |
| .11805E-03 | .17036E+00 | -.18715E-03 | .53756E-01 | .73893E-01 | .63013E+01 | 03690 |
| .12818E-03 | .18418E+00 | -.22664E-03 | .57051E-01 | .73895E-01 | .63397E+01 | 03700 |
| .15057E-03 | .21440E+00 | -.32916E-03 | .63693E-01 | .73899E-01 | .64105E+01 | 03710 |
| .17531E-03 | .24735E+00 | -.46826E-03 | .70074E-01 | .73909E-01 | .64676E+01 | 03720 |
| .20264E-03 | .28327E+00 | -.65391E-03 | .76026E-01 | .73921E-01 | .65061E+01 | 03730 |
| .23281E-03 | .32238E+00 | -.89874E-03 | .81344E-01 | .73940E-01 | .65201E+01 | 03740 |
| .26603E-03 | .36487E+00 | -.12154E-02 | .85796E-01 | .73963E-01 | .65026E+01 | 03750 |
| .30255E-03 | .41092E+00 | -.16199E-02 | .89122E-01 | .73996E-01 | .64449E+01 | 03760 |
| .34520E-03 | .46382E+00 | -.21580E-02 | .91112E-01 | .74038E-01 | .63289E+01 | 03770 |
| .39209E-03 | .52085E+00 | -.28244E-02 | .91200E-01 | .74092E-01 | .61434E+01 | 03780 |
| .44393E-03 | .58235E+00 | -.36240E-02 | .89066E-01 | .74157E-01 | .58715E+01 | 03790 |
| .50096E-03 | .64773E+00 | -.45491E-02 | .84454E-01 | .74232E-01 | .54972E+01 | 03800 |
| .56316E-03 | .71560E+00 | -.55400E-02 | .77325E-01 | .74322E-01 | .50102E+01 | 03810 |
| .63150E-03 | .78458E+00 | -.65258E-02 | .67862E-01 | .74415E-01 | .44019E+01 | 03820 |
| .70667E-03 | .85109E+00 | -.73572E-02 | .56863E-01 | .74525E-01 | .36883E+01 | 03830 |
| .78937E-03 | .90850E+00 | -.79675E-02 | .46274E-01 | .74612E-01 | .29378E+01 | 03840 |
| .88033E-03 | .94777E+00 | -.86197E-02 | .39435E-01 | .74686E-01 | .22980E+01 | 03850 |
| .97482E-03 | .96363E+00 | -.98531E-02 | .39612E-01 | .74710E-01 | .19479E+01 | 03860 |
| .10693E-02 | .96446E+00 | -.11404E-01 | .46264E-01 | .74744E-01 | .18681E+01 | 03870 |
| .11633E-02 | .96208E+00 | -.13360E-01 | .55898E-01 | .74629E-01 | .18945E+01 | 03880 |
| .12583E-02 | .96090E+00 | -.15414E-01 | .65454E-01 | .74570E-01 | .19153E+01 | 03890 |

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|---|---|---|---|---|---|---|
| .13525E-02 | .95971E+00 | -.17274E-01 | .74814E-01 | .74412E-01 | .19278E+01 | 03900 |
| .14468E-02 | .95840E+00 | -.19123E-01 | .84024E-01 | .74314E-01 | .19403E+01 | 03910 |
| .15410E-02 | .95714E+00 | -.20912E-01 | .92983E-01 | .74135E-01 | .19511E+01 | 03920 |
| .16353E-02 | .95583E+00 | -.22651E-01 | .10175E+00 | .74019E-01 | .19609E+01 | 03930 |
| .17296E-02 | .95448E+00 | -.24360E-01 | .11039E+00 | .73824E-01 | .19702E+01 | 03940 |
| .18238E-02 | .95308E+00 | -.25990E-01 | .11888E+00 | .73701E-01 | .19790E+01 | 03950 |
| .19157E-02 | .95167E+00 | -.27590E-01 | .12707E+00 | .73492E-01 | .19870E+01 | 03960 |
| .19982E-02 | .95037E+00 | -.28922E-01 | .13431E+00 | .73380E-01 | .19939E+01 | 03970 |
| .20712E-02 | .94921E+00 | -.30151E-01 | .14066E+00 | .73194E-01 | .19995E+01 | 03980 |
| .21372E-02 | .94814E+00 | -.31155E-01 | .14630E+00 | .73101E-01 | .20043E+01 | 03990 |
| .21961E-02 | .94719E+00 | -.32132E-01 | .15126E+00 | .72922E-01 | .20080E+01 | 04000 |
| .22502E-02 | .94633E+00 | -.32912E-01 | .15567E+00 | .72849E-01 | .20114E+01 | 04010 |
| .22998E-02 | .94557E+00 | -.33759E-01 | .15956E+00 | .72655E-01 | .20138E+01 | 04020 |
| .23446E-02 | .94490E+00 | -.34369E-01 | .16286E+00 | .72613E-01 | .20160E+01 | 04030 |
| .23846E-02 | .94436E+00 | -.35131E-01 | .16560E+00 | .72390E-01 | .20172E+01 | 04040 |
| .24209E-02 | .94392E+00 | -.35582E-01 | .16775E+00 | .72406E-01 | .20186E+01 | 04050 |
| .24539E-02 | .94359E+00 | -.36383E-01 | .16945E+00 | .72097E-01 | .20186E+01 | 04060 |
| .24845E-02 | .94334E+00 | -.36616E-01 | .17058E+00 | .72274E-01 | .20195E+01 | 04070 |
| .25128E-02 | .94324E+00 | -.37746E-01 | .17133E+00 | .71672E-01 | .20179E+01 | 04080 |
| .80000E+02 | .27205E-02 | | | | | 04090 |
| 0. | 0. | 0. | 0. | .63439E-01 | .55093E+01 | 04100 |
| .10204E-04 | .13996E-01 | .19663E-05 | .56721E-02 | .63441E-01 | .55956E+01 | 04110 |
| .21429E-04 | .29186E-01 | .82733E-05 | .11634E-01 | .63442E-01 | .56844E+01 | 04120 |
| .33674E-04 | .45531E-01 | .18933E-04 | .17821E-01 | .63444E-01 | .57742E+01 | 04130 |
| .47195E-04 | .63332E-01 | .34703E-04 | .24286E-01 | .63447E-01 | .58655E+01 | 04140 |
| .62246E-04 | .82872E-01 | .55631E-04 | .31053E-01 | .63448E-01 | .59580E+01 | 04150 |
| .78628E-04 | .10410E+00 | .81626E-04 | .38010E-01 | .63452E-01 | .60494E+01 | 04160 |
| .96941E-04 | .12696E+00 | .11164E-03 | .45041E-01 | .63455E-01 | .61375E+01 | 04170 |
| .10689E-03 | .13939E+00 | .12803E-03 | .48664E-01 | .63458E-01 | .61810E+01 | 04180 |
| .11684E-03 | .15174E+00 | .14417E-03 | .52122E-01 | .63461E-01 | .62211E+01 | 04190 |
| .12781E-03 | .16525E+00 | .16129E-03 | .55749E-01 | .63464E-01 | .62616E+01 | 04200 |
| .13878E-03 | .17868E+00 | .17749E-03 | .59187E-01 | .63468E-01 | .62983E+01 | 04210 |
| .16301E-03 | .20804E+00 | .20864E-03 | .66129E-01 | .63478E-01 | .63660E+01 | 04220 |
| .18980E-03 | .24007E+00 | .23290E-03 | .72818E-01 | .63490E-01 | .64210E+01 | 04230 |
| .21939E-03 | .27499E+00 | .24268E-03 | .79080E-01 | .63507E-01 | .64588E+01 | 04240 |
| .25205E-03 | .31301E+00 | .22955E-03 | .84707E-01 | .63528E-01 | .64739E+01 | 04250 |
| .28802E-03 | .35435E+00 | .18125E-03 | .89459E-01 | .63555E-01 | .64597E+01 | 04260 |
| .32756E-03 | .39919E+00 | .84352E-04 | .93070E-01 | .63586E-01 | .64085E+01 | 04270 |
| .37373E-03 | .45075E+00 | -.88460E-04 | .95334E-01 | .63628E-01 | .63034E+01 | 04280 |
| .42450E-03 | .50645E+00 | -.35150E-03 | .95650E-01 | .63676E-01 | .61337E+01 | 04290 |
| .48062E-03 | .56669E+00 | -.71851E-03 | .93681E-01 | .63734E-01 | .58831E+01 | 04300 |
| .54236E-03 | .63106E+00 | -.11936E-02 | .89139E-01 | .63795E-01 | .55357E+01 | 04310 |
| .60971E-03 | .69844E+00 | -.17421E-02 | .81936E-01 | .63869E-01 | .50792E+01 | 04320 |
| .68369E-03 | .76786E+00 | -.23083E-02 | .72164E-01 | .63938E-01 | .45004E+01 | 04330 |

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|---|---|---|---|---|---|---|
| .76507E-03 | .83644E+00 | -.27522E-02 | .60463E-01 | .64025E-01 | .38046E+01 | 04340 |
| .85461E-03 | .89834E+00 | -.29614E-02 | .48543E-01 | .64085E-01 | .30408E+01 | 04350 |
| .95308E-03 | .94416E+00 | -.30598E-02 | .39702E-01 | .64151E-01 | .23407E+01 | 04360 |
| .10554E-02 | .96549E+00 | -.37307E-02 | .37937E-01 | .64152E-01 | .19109E+01 | 04370 |
| .11577E-02 | .96859E+00 | -.48362E-02 | .43581E-01 | .64207E-01 | .17803E+01 | 04380 |
| .12600E-02 | .96625E+00 | -.62850E-02 | .53483E-01 | .64114E-01 | .17957E+01 | 04390 |
| .13623E-02 | .96507E+00 | -.79122E-02 | .63820E-01 | .64076E-01 | .18160E+01 | 04400 |
| .14643E-02 | .96406E+00 | -.92781E-02 | .73959E-01 | .63956E-01 | .18246E+01 | 04410 |
| .15664E-02 | .96282E+00 | -.10590E-01 | .84062E-01 | .63888E-01 | .18337E+01 | 04420 |
| .16684E-02 | .96165E+00 | -.11832E-01 | .93905E-01 | .63761E-01 | .18412E+01 | 04430 |
| .17704E-02 | .96041E+00 | -.12988E-01 | .10356E+00 | .63690E-01 | .18476E+01 | 04440 |
| .18725E-02 | .95911E+00 | -.14110E-01 | .11308E+00 | .63566E-01 | .18534E+01 | 04450 |
| .19745E-02 | .95775E+00 | -.15115E-01 | .12246E+00 | .63510E-01 | .18587E+01 | 04460 |
| .20740E-02 | .95637E+00 | -.16109E-01 | .13152E+00 | .63392E-01 | .18634E+01 | 04470 |
| .21633E-02 | .95508E+00 | -.16867E-01 | .13955E+00 | .63364E-01 | .18673E+01 | 04480 |
| .22424E-02 | .95390E+00 | -.17594E-01 | .14662E+00 | .63270E-01 | .18704E+01 | 04490 |
| .23138E-02 | .95282E+00 | -.18125E-01 | .15290E+00 | .63264E-01 | .18730E+01 | 04500 |
| .23776E-02 | .95185E+00 | -.18692E-01 | .15844E+00 | .63177E-01 | .18748E+01 | 04510 |
| .24363E-02 | .95095E+00 | -.19077E-01 | .16340E+00 | .63193E-01 | .18766E+01 | 04520 |
| .24898E-02 | .95015E+00 | -.19586E-01 | .16779E+00 | .63088E-01 | .18776E+01 | 04530 |
| .25383E-02 | .94944E+00 | -.19868E-01 | .17152E+00 | .63134E-01 | .18788E+01 | 04540 |
| .25817E-02 | .94887E+00 | -.20377E-01 | .17464E+00 | .62993E-01 | .18791E+01 | 04550 |
| .26210E-02 | .94839E+00 | -.20563E-01 | .17709E+00 | .63094E-01 | .18799E+01 | 04560 |
| .26567E-02 | .94804E+00 | -.21199E-01 | .17902E+00 | .62854E-01 | .18794E+01 | 04570 |
| .26898E-02 | .94777E+00 | -.21195E-01 | .18027E+00 | .63120E-01 | .18803E+01 | 04580 |
| .27205E-02 | .94767E+00 | -.22286E-01 | .18107E+00 | .62568E-01 | .18785E+01 | 04590 |
| .90000E+02 | .29473E-02 | | | | | 04600 |
| 0. | 0. | 0. | 0. | .54495E-01 | .55093E+01 | 04610 |
| .11055E-04 | .13569E-01 | .45648E-05 | .56575E-02 | .54499E-01 | .55911E+01 | 04620 |
| .23216E-04 | .28301E-01 | .19797E-04 | .11609E-01 | .54504E-01 | .56753E+01 | 04630 |
| .36483E-04 | .44162E-01 | .46655E-04 | .17792E-01 | .54508E-01 | .57605E+01 | 04640 |
| .51131E-04 | .61443E-01 | .88199E-04 | .24259E-01 | .54514E-01 | .58472E+01 | 04650 |
| .67437E-04 | .80419E-01 | .14652E-03 | .31036E-01 | .54518E-01 | .59350E+01 | 04660 |
| .85402E-04 | .10104E+00 | .22402E-03 | .38010E-01 | .54527E-01 | .60219E+01 | 04670 |
| .10503E-03 | .12320E+00 | .32147E-03 | .45068E-01 | .54531E-01 | .61057E+01 | 04680 |
| .11580E-03 | .13534E+00 | .37948E-03 | .48709E-01 | .54537E-01 | .61471E+01 | 04690 |
| .12658E-03 | .14734E+00 | .44039E-03 | .52180E-01 | .54540E-01 | .61853E+01 | 04700 |
| .13847E-03 | .16048E+00 | .51023E-03 | .55839E-01 | .54546E-01 | .62239E+01 | 04710 |
| .15035E-03 | .17354E+00 | .58267E-03 | .59303E-01 | .54551E-01 | .62589E+01 | 04720 |
| .17661E-03 | .20209E+00 | .74907E-03 | .66311E-01 | .54566E-01 | .63238E+01 | 04730 |
| .20563E-03 | .23324E+00 | .93948E-03 | .73082E-01 | .54579E-01 | .63767E+01 | 04740 |
| .23769E-03 | .26720E+00 | .11490E-02 | .79444E-01 | .54600E-01 | .64136E+01 | 04750 |
| .27307E-03 | .30420E+00 | .13744E-02 | .85192E-01 | .54619E-01 | .64295E+01 | 04760 |
| .31204E-03 | .34443E+00 | .16046E-02 | .90087E-01 | .54647E-01 | .64182E+01 | 04770 |

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| .35488E-03 | .38808E+00 | .18304E-02 | .93863E-01 | .54675E-01 | .63725E+01 | 04780 |
| .40490E-03 | .43832E+00 | .20462E-02 | .96327E-01 | .54714E-01 | .62769E+01 | 04790 |
| .45990E-03 | .49268E+00 | .22207E-02 | .96867E-01 | .54752E-01 | .61212E+01 | 04800 |
| .52070E-03 | .55163E+00 | .23344E-02 | .95138E-01 | .54801E-01 | .58900E+01 | 04810 |
| .58759E-03 | .61488E+00 | .23778E-02 | .90834E-01 | .54844E-01 | .55674E+01 | 04820 |
| .66055E-03 | .68153E+00 | .23625E-02 | .83830E-01 | .54899E-01 | .51400E+01 | 04830 |
| .74071E-03 | .75102E+00 | .23349E-02 | .74140E-01 | .54940E-01 | .45915E+01 | 04840 |
| .82887E-03 | .82108E+00 | .24156E-02 | .62244E-01 | .54997E-01 | .39184E+01 | 04850 |
| .92588E-03 | .88674E+00 | .27394E-02 | .49561E-01 | .55024E-01 | .31522E+01 | 04860 |
| .10326E-02 | .93887E+00 | .32977E-02 | .39117E-01 | .55061E-01 | .24029E+01 | 04870 |
| .11434E-02 | .96629E+00 | .33239E-02 | .35357E-01 | .55024E-01 | .18932E+01 | 04880 |
| .12542E-02 | .97236E+00 | .26711E-02 | .39532E-01 | .55049E-01 | .17036E+01 | 04890 |
| .13651E-02 | .97032E+00 | .16727E-02 | .49108E-01 | .54956E-01 | .17018E+01 | 04900 |
| .14759E-02 | .96909E+00 | .44094E-03 | .59870E-01 | .54890E-01 | .17217E+01 | 04910 |
| .15864E-02 | .96833E+00 | -.50176E-03 | .70475E-01 | .54773E-01 | .17267E+01 | 04920 |
| .16970E-02 | .96722E+00 | -.13009E-02 | .81191E-01 | .54685E-01 | .17322E+01 | 04930 |
| .18075E-02 | .96616E+00 | -.20437E-02 | .91675E-01 | .54568E-01 | .17365E+01 | 04940 |
| .19181E-02 | .96503E+00 | -.26374E-02 | .10198E+00 | .54488E-01 | .17394E+01 | 04950 |
| .20286E-02 | .96382E+00 | -.32035E-02 | .11216E+00 | .54383E-01 | .17419E+01 | 04960 |
| .21392E-02 | .96254E+00 | -.36025E-02 | .12222E+00 | .54335E-01 | .17440E+01 | 04970 |
| .22470E-02 | .96122E+00 | -.40065E-02 | .13194E+00 | .54251E-01 | .17455E+01 | 04980 |
| .23437E-02 | .95997E+00 | -.42035E-02 | .14057E+00 | .54248E-01 | .17467E+01 | 04990 |
| .24294E-02 | .95882E+00 | -.44349E-02 | .14818E+00 | .54196E-01 | .17473E+01 | 05000 |
| .25068E-02 | .95775E+00 | -.44998E-02 | .15497E+00 | .54228E-01 | .17479E+01 | 05010 |
| .25759E-02 | .95677E+00 | -.46588E-02 | .16097E+00 | .54189E-01 | .17480E+01 | 05020 |
| .26395E-02 | .95586E+00 | -.46532E-02 | .16637E+00 | .54250E-01 | .17482E+01 | 05030 |
| .26975E-02 | .95504E+00 | -.48245E-02 | .17117E+00 | .54200E-01 | .17480E+01 | 05040 |
| .27500E-02 | .95431E+00 | -.47823E-02 | .17527E+00 | .54296E-01 | .17481E+01 | 05050 |
| .27970E-02 | .95371E+00 | -.50405E-02 | .17870E+00 | .54210E-01 | .17476E+01 | 05060 |
| .28396E-02 | .95320E+00 | -.49617E-02 | .18141E+00 | .54366E-01 | .17479E+01 | 05070 |
| .28782E-02 | .95284E+00 | -.54443E-02 | .18354E+00 | .54175E-01 | .17470E+01 | 05080 |
| .29142E-02 | .95254E+00 | -.51909E-02 | .18488E+00 | .54509E-01 | .17480E+01 | 05090 |
| .29473E-02 | .95247E+00 | -.62921E-02 | .18572E+00 | .53979E-01 | .17459E+01 | 05100 |
| .10000E+03 | .31869E-02 | | | | | 05110 |
| 0. | 0. | 0. | 0. | .47092E-01 | .55093E+01 | 05120 |
| .11954E-04 | .13201E-01 | .69531E-05 | .54612E-02 | .47098E-01 | .55970E+01 | 05130 |
| .25103E-04 | .27542E-01 | .30490E-04 | .11211E-01 | .47105E-01 | .56670E+01 | 05140 |
| .39448E-04 | .42986E-01 | .72399E-04 | .17190E-01 | .47111E-01 | .57481E+01 | 05150 |
| .55286E-04 | .59819E-01 | .13798E-03 | .23449E-01 | .47121E-01 | .58305E+01 | 05160 |
| .72918E-04 | .78310E-01 | .23122E-03 | .30014E-01 | .47126E-01 | .59142E+01 | 05170 |
| .92343E-04 | .98409E-01 | .35695E-03 | .36778E-01 | .47139E-01 | .59970E+01 | 05180 |
| .11356E-03 | .12007E+00 | .51772E-03 | .43632E-01 | .47144E-01 | .60769E+01 | 05190 |
| .12522E-03 | .13185E+00 | .61488E-03 | .47172E-01 | .47151E-01 | .61164E+01 | 05200 |
| .13687E-03 | .14355E+00 | .71798E-03 | .50555E-01 | .47155E-01 | .61530E+01 | 05210 |

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|---|---|---|---|---|---|---|
| .14972E-03 | .15637E+00 | .83758E-03 | .54110E-01 | .47163E-01 | .61899E+01 | 05220 |
| .16257E-03 | .16910E+00 | .96318E-03 | .57485E-01 | .47168E-01 | .62233E+01 | 05230 |
| .19096E-03 | .19695E+00 | .12578E-02 | .64323E-01 | .47186E-01 | .62855E+01 | 05240 |
| .22234E-03 | .22732E+00 | .16065E-02 | .70946E-01 | .47198E-01 | .63365E+01 | 05250 |
| .25701E-03 | .26045E+00 | .20072E-02 | .77191E-01 | .47223E-01 | .63725E+01 | 05260 |
| .29526E-03 | .29653E+00 | .24628E-02 | .82858E-01 | .47236E-01 | .63867E+01 | 05270 |
| .33740E-03 | .33577E+00 | .29636E-02 | .87719E-01 | .47266E-01 | .63794E+01 | 05280 |
| .38372E-03 | .37835E+00 | .35066E-02 | .91517E-01 | .47287E-01 | .63380E+01 | 05290 |
| .43781E-03 | .42740E+00 | .41092E-02 | .94075E-01 | .47322E-01 | .62499E+01 | 05300 |
| .49728E-03 | .48052E+00 | .47273E-02 | .94790E-01 | .47348E-01 | .61056E+01 | 05310 |
| .56303E-03 | .53823E+00 | .53395E-02 | .93323E-01 | .47389E-01 | .58904E+01 | 05320 |
| .63535E-03 | .60036E+00 | .59376E-02 | .89368E-01 | .47410E-01 | .55887E+01 | 05330 |
| .71424E-03 | .66619E+00 | .65191E-02 | .82773E-01 | .47443E-01 | .51867E+01 | 05340 |
| .80091E-03 | .73544E+00 | .71188E-02 | .73498E-01 | .47458E-01 | .46660E+01 | 05350 |
| .89624E-03 | .80639E+00 | .78461E-02 | .61888E-01 | .47481E-01 | .40171E+01 | 05360 |
| .10011E-02 | .87492E+00 | .88435E-02 | .49076E-01 | .47472E-01 | .32572E+01 | 05370 |
| .11165E-02 | .93253E+00 | .10166E-01 | .37685E-01 | .47467E-01 | .24733E+01 | 05380 |
| .12363E-02 | .96604E+00 | .11028E-01 | .32241E-01 | .47385E-01 | .18913E+01 | 05390 |
| .13562E-02 | .97554E+00 | .10879E-01 | .34792E-01 | .47342E-01 | .16399E+01 | 05400 |
| .14760E-02 | .97411E+00 | .10248E-01 | .43522E-01 | .47224E-01 | .16155E+01 | 05410 |
| .15958E-02 | .97282E+00 | .93532E-02 | .54270E-01 | .47096E-01 | .16346E+01 | 05420 |
| .17154E-02 | .97234E+00 | .87367E-02 | .64976E-01 | .46953E-01 | .16363E+01 | 05430 |
| .18349E-02 | .97140E+00 | .83862E-02 | .75945E-01 | .46812E-01 | .16379E+01 | 05440 |
| .19545E-02 | .97050E+00 | .80718E-02 | .86758E-01 | .46666E-01 | .16392E+01 | 05450 |
| .20740E-02 | .96953E+00 | .79814E-02 | .97406E-01 | .46543E-01 | .16388E+01 | 05460 |
| .21935E-02 | .96845E+00 | .79158E-02 | .10795E+00 | .46414E-01 | .16382E+01 | 05470 |
| .23131E-02 | .96731E+00 | .80707E-02 | .11839E+00 | .46333E-01 | .16372E+01 | 05480 |
| .24296E-02 | .96609E+00 | .82145E-02 | .12850E+00 | .46234E-01 | .16359E+01 | 05490 |
| .25342E-02 | .96493E+00 | .85371E-02 | .13749E+00 | .46214E-01 | .16346E+01 | 05500 |
| .26269E-02 | .96384E+00 | .87741E-02 | .14542E+00 | .45161E-01 | .16331E+01 | 05510 |
| .27105E-02 | .96281E+00 | .91425E-02 | .15252E+00 | .46188E-01 | .16318E+01 | 05520 |
| .27852E-02 | .96188E+00 | .93728E-02 | .15882E+00 | .46159E-01 | .16304E+01 | 05530 |
| .28540E-02 | .96098E+00 | .97409E-02 | .16449E+00 | .46226E-01 | .16292E+01 | 05540 |
| .29167E-02 | .96018E+00 | .98920E-02 | .16957E+00 | .46196E-01 | .16278E+01 | 05550 |
| .29735E-02 | .95945E+00 | .10234E-01 | .17391E+00 | .46307E-01 | .16270E+01 | 05560 |
| .30243E-02 | .95885E+00 | .10213E-01 | .17758E+00 | .46248E-01 | .16257E+01 | 05570 |
| .30703E-02 | .95833E+00 | .10538E-01 | .18047E+00 | .46427E-01 | .16255E+01 | 05580 |
| .31122E-02 | .95797E+00 | .10188E-01 | .18274E+00 | .46264E-01 | .16242E+01 | 05590 |
| .31510E-02 | .95765E+00 | .10695E-01 | .18414E+00 | .46642E-01 | .16254E+01 | 05600 |
| .31869E-02 | .95761E+00 | .95035E-02 | .18500E+00 | .46101E-01 | .16230E+01 | 05610 |
| .11000E+03 | .34309E-02 | | | | | 05620 |
| 0. | 0. | 0. | 0. | .41109E-01 | .55093E+01 | 05630 |
| .12869E-04 | .12915E-01 | .90154E-05 | .51064E-02 | .41117E-01 | .55834E+01 | 05640 |
| .27025E-04 | .26948E-01 | .39826E-04 | .10487E-01 | .41126E-01 | .56598E+01 | 05650 |

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| .42468E-04 | .42067E-01 | .94887E-04 | .16085E-01 | .41133E-01 | .57373E+01 | 05660 |
| .59520E-04 | .58550E-01 | .18157E-03 | .21950E-01 | .41145E-01 | .58162E+01 | 05670 |
| .78502E-04 | .76662E-01 | .30546E-03 | .28107E-01 | .41150E-01 | .58962E+01 | 05680 |
| .99415E-04 | .96352E-01 | .47366E-03 | .34457E-01 | .41167E-01 | .59755E+01 | 05690 |
| .12226E-03 | .11757E+00 | .69031E-03 | .40897E-01 | .41171E-01 | .60522E+01 | 05700 |
| .13481E-03 | .12912E+00 | .82209E-03 | .44225E-01 | .41180E-01 | .60901E+01 | 05710 |
| .14735E-03 | .14059E+00 | .96257E-03 | .47409E-01 | .41184E-01 | .61251E+01 | 05720 |
| .16119E-03 | .15314E+00 | .11263E-02 | .50756E-01 | .41193E-01 | .61606E+01 | 05730 |
| .17502E-03 | .16562E+00 | .12992E-02 | .53936E-01 | .41198E-01 | .61927E+01 | 05740 |
| .20559E-03 | .19290E+00 | .17080E-02 | .60387E-01 | .41218E-01 | .62525E+01 | 05750 |
| .23937E-03 | .22266E+00 | .21985E-02 | .66648E-01 | .41228E-01 | .63017E+01 | 05760 |
| .27669E-03 | .25511E+00 | .27713E-02 | .72565E-01 | .41252E-01 | .63365E+01 | 05770 |
| .31787E-03 | .29045E+00 | .34354E-02 | .77955E-01 | .41265E-01 | .63526E+01 | 05780 |
| .36323E-03 | .32888E+00 | .41833E-02 | .82603E-01 | .41291E-01 | .63445E+01 | 05790 |
| .41310E-03 | .37059E+00 | .50193E-02 | .86269E-01 | .41306E-01 | .63059E+01 | 05800 |
| .47134E-03 | .41863E+00 | .59833E-02 | .88795E-01 | .41334E-01 | .62230E+01 | 05810 |
| .53536E-03 | .47069E+00 | .70235E-02 | .89607E-01 | .41348E-01 | .60870E+01 | 05820 |
| .60614E-03 | .52733E+00 | .81197E-02 | .88385E-01 | .41373E-01 | .58835E+01 | 05830 |
| .68400E-03 | .58844E+00 | .92719E-02 | .84833E-01 | .41380E-01 | .55979E+01 | 05840 |
| .76894E-03 | .65345E+00 | .10461E-01 | .78790E-01 | .41392E-01 | .52160E+01 | 05850 |
| .86224E-03 | .72231E+00 | .11745E-01 | .70185E-01 | .41382E-01 | .47183E+01 | 05860 |
| .96487E-03 | .79369E+00 | .13200E-01 | .59263E-01 | .41373E-01 | .40915E+01 | 05870 |
| .10778E-02 | .86418E+00 | .14986E-01 | .46914E-01 | .41331E-01 | .33423E+01 | 05880 |
| .12020E-02 | .92610E+00 | .17168E-01 | .35327E-01 | .41279E-01 | .25380E+01 | 05890 |
| .13310E-02 | .96509E+00 | .18970E-01 | .28787E-01 | .41152E-01 | .18972E+01 | 05900 |
| .14600E-02 | .97807E+00 | .19404E-01 | .29866E-01 | .41021E-01 | .15883E+01 | 05910 |
| .15890E-02 | .97746E+00 | .19071E-01 | .37428E-01 | .40854E-01 | .15387E+01 | 05920 |
| .17180E-02 | .97614E+00 | .18434E-01 | .47696E-01 | .40649E-01 | .15561E+01 | 05930 |
| .18467E-02 | .97596E+00 | .18050E-01 | .58108E-01 | .40456E-01 | .15547E+01 | 05940 |
| .19754E-02 | .97524E+00 | .18057E-01 | .68915E-01 | .40247E-01 | .15524E+01 | 05950 |
| .21041E-02 | .97452E+00 | .18090E-01 | .79681E-01 | .40050E-01 | .15507E+01 | 05960 |
| .22328E-02 | .97376E+00 | .18418E-01 | .90299E-01 | .39866E-01 | .15473E+01 | 05970 |
| .23615E-02 | .97286E+00 | .18782E-01 | .10086E+00 | .39686E-01 | .15439E+01 | 05980 |
| .24902E-02 | .97189E+00 | .19411E-01 | .11132E+00 | .39548E-01 | .15401E+01 | 05990 |
| .26157E-02 | .97083E+00 | .20041E-01 | .12148E+00 | .39404E-01 | .15363E+01 | 06000 |
| .27283E-02 | .96981E+00 | .20817E-01 | .13051E+00 | .39337E-01 | .15328E+01 | 06010 |
| .28280E-02 | .96884E+00 | .21478E-01 | .13851E+00 | .39254E-01 | .15296E+01 | 06020 |
| .29181E-02 | .96790E+00 | .22228E-01 | .14567E+00 | .39246E-01 | .15268E+01 | 06030 |
| .29985E-02 | .96704E+00 | .22813E-01 | .15204E+00 | .39199E-01 | .15240E+01 | 06040 |
| .30725E-02 | .96622E+00 | .23498E-01 | .15779E+00 | .39240E-01 | .15217E+01 | 06050 |
| .31401E-02 | .96547E+00 | .23943E-01 | .16295E+00 | .39205E-01 | .15192E+01 | 06060 |
| .32012E-02 | .96478E+00 | .24541E-01 | .16739E+00 | .39297E-01 | .15176E+01 | 06070 |
| .32559E-02 | .96422E+00 | .24734E-01 | .17115E+00 | .39246E-01 | .15156E+01 | 06080 |
| .33055E-02 | .96371E+00 | .25266E-01 | .17412E+00 | .39416E-01 | .15150E+01 | 06090 |

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| .33505E-02 | .96338E+00 | .25020E-01 | .17645E+00 | .39263E-01 | .15132E+01 | 06100 |
| .33923E-02 | .96305E+00 | .25777E-01 | .17786E+00 | .39661E-01 | .15146E+01 | 06110 |
| .34309E-02 | .96307E+00 | .24370E-01 | .17872E+00 | .39070E-01 | .15115E+01 | 06120 |
| .12000E+03 | .36703E-02 | | | | | 06130 |
| 0. | 0. | 0. | 0. | .36364E-01 | .55097E+01 | 06140 |
| .13767E-04 | .12716E-01 | .10700E-04 | .46172E-02 | .36373E-01 | .55[illegible]+01 | 06150 |
| .28911E-04 | .26537E-01 | .47547E-04 | .94847E-02 | .36383E-01 | .56539E+01 | 06160 |
| .45431E-04 | .41431E-01 | .11348E-03 | .14552E-01 | .36391E-01 | .57285E+01 | 06170 |
| .63672E-04 | .57672E-01 | .21769E-03 | .19864E-01 | .36405E-01 | .58044E+01 | 06180 |
| .83978E-04 | .75520E-01 | .36705E-03 | .25444E-01 | .36410E-01 | .58816E+01 | 06190 |
| .10635E-03 | .94926E-01 | .57062E-03 | .31202E-01 | .36429E-01 | .59580E+01 | 06200 |
| .13079E-03 | .11584E+00 | .83392E-03 | .37047E-01 | .36433E-01 | .60319E+01 | 06210 |
| .14421E-03 | .12722E+00 | .99465E-03 | .40069E-01 | .36442E-01 | .60685E+01 | 06220 |
| .15763E-03 | .13852E+00 | .11664E-02 | .42961E-01 | .36446E-01 | .61023E+01 | 06230 |
| .17243E-03 | .15090E+00 | .13672E-02 | .46003E-01 | .36455E-01 | .61365E+01 | 06240 |
| .18723E-03 | .16320E+00 | .15798E-02 | .48895E-01 | .36460E-01 | .61676E+01 | 06250 |
| .21993E-03 | .19008E+00 | .20848E-02 | .54765E-01 | .36482E-01 | .62253E+01 | 06260 |
| .25606E-03 | .21940E+00 | .26953E-02 | .60470E-01 | .36490E-01 | .62727E+01 | 06270 |
| .29599E-03 | .25137E+00 | .34144E-02 | .65871E-01 | .36513E-01 | .63063E+01 | 06280 |
| .34004E-03 | .28617E+00 | .42574E-02 | .70803E-01 | .36521E-01 | .63218E+01 | 06290 |
| .38857E-03 | .32400E+00 | .52186E-02 | .75071E-01 | .36545E-01 | .63139E+01 | 06300 |
| .44192E-03 | .36504E+00 | .63103E-02 | .78457E-01 | .36552E-01 | .62767E+01 | 06310 |
| .50421E-03 | .41232E+00 | .75937E-02 | .80824E-01 | .36574E-01 | .61969E+01 | 06320 |
| .57270E-03 | .46356E+00 | .90134E-02 | .81645E-01 | .36576E-01 | .60658E+01 | 06330 |
| .64842E-03 | .51934E+00 | .10553E-01 | .80629E-01 | .36589E-01 | .58701E+01 | 06340 |
| .73171E-03 | .57961E+00 | .12226E-01 | .77502E-01 | .36579E-01 | .55954E+01 | 06350 |
| .82257E-03 | .64390E+00 | .14006E-01 | .72109E-01 | .36574E-01 | .52276E+01 | 06360 |
| .92238E-03 | .71231E+00 | .15970E-01 | .64367E-01 | .36542E-01 | .47470E+01 | 06370 |
| .10322E-02 | .78381E+00 | .18182E-01 | .54451E-01 | .36505E-01 | .41379E+01 | 06380 |
| .11530E-02 | .85553E+00 | .20815E-01 | .43062E-01 | .36434E-01 | .34003E+01 | 06390 |
| .12858E-02 | .92053E+00 | .23915E-01 | .31988E-01 | .36338E-01 | .25860E+01 | 06400 |
| .14238E-02 | .96394E+00 | .26707E-01 | .25056E-01 | .36169E-01 | .19024E+01 | 06410 |
| .15619E-02 | .98003E+00 | .27784E-01 | .25032E-01 | .35951E-01 | .15455E+01 | 06420 |
| .16999E-02 | .98050E+00 | .27710E-01 | .31320E-01 | .35718E-01 | .14723E+01 | 06430 |
| .18379E-02 | .97898E+00 | .27256E-01 | .40698E-01 | .35435E-01 | .14869E+01 | 06440 |
| .19756E-02 | .97909E+00 | .27028E-01 | .50417E-01 | .35181E-01 | .14829E+01 | 06450 |
| .21132E-02 | .97863E+00 | .27300E-01 | .60629E-01 | .34904E-01 | .14767E+01 | 06460 |
| .22509E-02 | .97813E+00 | .27599E-01 | .70927E-01 | .34645E-01 | .14723E+01 | 06470 |
| .23886E-02 | .97760E+00 | .28253E-01 | .81105E-01 | .34397E-01 | .14662E+01 | 06480 |
| .25262E-02 | .97692E+00 | .28966E-01 | .91275E-01 | .34155E-01 | .14603E+01 | 06490 |
| .26639E-02 | .97617E+00 | .29977E-01 | .10135E+00 | .33953E-01 | .14541E+01 | 06500 |
| .27981E-02 | .97532E+00 | .31015E-01 | .11118E+00 | .33748E-01 | .14482E+01 | 06510 |
| .29186E-02 | .97448E+00 | .32165E-01 | .11992E+00 | .33621E-01 | .14430E+01 | 06520 |
| .30253E-02 | .97366E+00 | .33186E-01 | .12767E+00 | .33491E-01 | .14383E+01 | 06530 |

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|---|---|---|---|---|---|---|
| .31216E-02 | .97288E+00 | .34251E-01 | .13460E+00 | .33432E-01 | .14342E+01 | 06540 |
| .32077E-02 | .97214E+00 | .35140E-01 | .14078E+00 | .33350E-01 | .14303E+01 | 06550 |
| .32868E-02 | .97143E+00 | .36080E-01 | .14638E+00 | .33344E-01 | .14271E+01 | 06560 |
| .33591E-02 | .97079E+00 | .36777E-01 | .15141E+00 | .33286E-01 | .14238E+01 | 06570 |
| .34245E-02 | .97018E+00 | .37569E-01 | .15575E+00 | .33336E-01 | .14214E+01 | 06580 |
| .34930E-02 | .96970E+00 | .37943E-01 | .15944E+00 | .33276E-01 | .14188E+01 | 06590 |
| .35360E-02 | .96924E+00 | .38622E-01 | .16236E+00 | .33411E-01 | .14177E+01 | 06600 |
| .35842E-02 | .96897E+00 | .38450E-01 | .16465E+00 | .33257E-01 | .14154E+01 | 06610 |
| .36290E-02 | .96863E+00 | .39433E-01 | .16600E+00 | .33650E-01 | .14169E+01 | 06620 |
| .36703E-02 | .96877E+00 | .37627E-01 | .16684E+00 | .32969E-01 | .14126E+01 | 06630 |
| .13000E+03 | .38944E-02 | | | | | 06640 |
| 0. | 0. | 0. | 0. | .32669E-01 | .55093E+01 | 06650 |
| .14608E-04 | .12601E-01 | .12007E-04 | .40173E-02 | .32678E-01 | .55782E+01 | 06660 |
| .30676E-04 | .26299E-01 | .53621E-04 | .82540E-02 | .32689E-01 | .56493E+01 | 06670 |
| .48205E-04 | .41064E-01 | .12811E-03 | .12666E-01 | .32697E-01 | .57216E+01 | 06680 |
| .67560E-04 | .57165E-01 | .24615E-03 | .17292E-01 | .32712E-01 | .57953E+01 | 06690 |
| .89106E-04 | .74862E-01 | .41560E-03 | .22155E-01 | .32717E-01 | .58702E+01 | 06700 |
| .11284E-03 | .94104E-01 | .64714E-03 | .27175E-01 | .32737E-01 | .59445E+01 | 06710 |
| .13877E-03 | .11485E+00 | .94741E-03 | .32272E-01 | .32741E-01 | .60163E+01 | 06720 |
| .15301E-03 | .12613E+00 | .11311E-02 | .34908E-01 | .32750E-01 | .60518E+01 | 06730 |
| .16726E-03 | .13733E+00 | .13278E-02 | .37432E-01 | .32754E-01 | .60846E+01 | 06740 |
| .18296E-03 | .14960E+00 | .15580E-02 | .40086E-01 | .32763E-01 | .61178E+01 | 06750 |
| .19866E-03 | .16179E+00 | .18022E-02 | .42611E-01 | .32768E-01 | .61480E+01 | 06760 |
| .23336E-03 | .18844E+00 | .23840E-02 | .47739E-01 | .32790E-01 | .62039E+01 | 06770 |
| .27170E-03 | .21749E+00 | .30909E-02 | .52725E-01 | .32795E-01 | .62498E+01 | 06780 |
| .31406E-03 | .24915E+00 | .39280E-02 | .57451E-01 | .32818E-01 | .62821E+01 | 06790 |
| .36081E-03 | .28361E+00 | .49163E-02 | .61771E-01 | .32821E-01 | .62965E+01 | 06800 |
| .41230E-03 | .32105E+00 | .60522E-02 | .65516E-01 | .32842E-01 | .62881E+01 | 06810 |
| .46890E-03 | .36165E+00 | .73555E-02 | .68497E-01 | .32842E-01 | .62509E+01 | 06820 |
| .53500E-03 | .40841E+00 | .89063E-02 | .70595E-01 | .32858E-01 | .61721E+01 | 06830 |
| .60768E-03 | .45907E+00 | .10649E-01 | .71348E-01 | .32848E-01 | .60434E+01 | 06840 |
| .68802E-03 | .51422E+00 | .12573E-01 | .70501E-01 | .32851E-01 | .58517E+01 | 06850 |
| .77639E-03 | .57386E+00 | .14708E-01 | .67814E-01 | .32826E-01 | .55832E+01 | 06860 |
| .87280E-03 | .63757E+00 | .17025E-01 | .63148E-01 | .32806E-01 | .52241E+01 | 06870 |
| .97871E-03 | .70555E+00 | .19626E-01 | .56420E-01 | .32755E-01 | .47547E+01 | 06880 |
| .10952E-02 | .77700E+00 | .22566E-01 | .47763E-01 | .32698E-01 | .41583E+01 | 06890 |
| .12234E-02 | .84940E+00 | .26040E-01 | .37728E-01 | .32602E-01 | .34306E+01 | 06900 |
| .13643E-02 | .91641E+00 | .30056E-01 | .27749E-01 | .32471E-01 | .26128E+01 | 06910 |
| .15108E-02 | .96303E+00 | .33817E-01 | .21083E-01 | .32264E-01 | .19011E+01 | 06920 |
| .16572E-02 | .98157E+00 | .35547E-01 | .20399E-01 | .31972E-01 | .15085E+01 | 06930 |
| .18037E-02 | .98260E+00 | .35714E-01 | .25452E-01 | .31669E-01 | .14161E+01 | 06940 |
| .19501E-02 | .98133E+00 | .35388E-01 | .33625E-01 | .31317E-01 | .14278E+01 | 06950 |
| .20962E-02 | .98172E+00 | .35268E-01 | .42281E-01 | .31003E-01 | .14212E+01 | 06960 |
| .22423E-02 | .98151E+00 | .35726E-01 | .51485E-01 | .30665E-01 | .14116E+01 | 06970 |

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| .23883E-02 | .98124E+00 | .36221E-01 | .60882E-01 | .30347E-01 | .14048E+01 | 06980 |
| .25344E-02 | .98096E+00 | .37114E-01 | .70193E-01 | .30041E-01 | .13963E+01 | 06990 |
| .26805E-02 | .98052E+00 | .38097E-01 | .79546E-01 | .29739E-01 | .13883E+01 | 07000 |
| .28266E-02 | .98002E+00 | .39398E-01 | .88825E-01 | .29475E-01 | .13802E+01 | 07010 |
| .29690E-02 | .97941E+00 | .40758E-01 | .97902E-01 | .29208E-01 | .13726E+01 | 07020 |
| .30968E-02 | .97879E+00 | .42196E-01 | .10597E+00 | .29020E-01 | .13660E+01 | 07030 |
| .32100E-02 | .97818E+00 | .43504E-01 | .11314E+00 | .28837E-01 | .13601E+01 | 07040 |
| .33123E-02 | .97758E+00 | .44808E-01 | .11955E+00 | .28721E-01 | .13550E+01 | 07050 |
| .34036E-02 | .97702E+00 | .45937E-01 | .12527E+00 | .28595E-01 | .13504E+01 | 07060 |
| .34876E-02 | .97646E+00 | .47061E-01 | .13045E+00 | .28533E-01 | .13463E+01 | 07070 |
| .35643E-02 | .97596E+00 | .47953E-01 | .13512E+00 | .28441E-01 | .13424E+01 | 07080 |
| .36336E-02 | .97549E+00 | .48866E-01 | .13917E+00 | .28436E-01 | .13393E+01 | 07090 |
| .36957E-02 | .97511E+00 | .49380E-01 | .14260E+00 | .28356E-01 | .13361E+01 | 07100 |
| .37520E-02 | .97475E+00 | .50124E-01 | .14533E+00 | .28436E-01 | .13344E+01 | 07110 |
| .38031E-02 | .97456E+00 | .50008E-01 | .14746E+00 | .28279E-01 | .13317E+01 | 07120 |
| .38506E-02 | .97425E+00 | .51153E-01 | .14869E+00 | .28641E-01 | .13331E+01 | 07130 |
| .38944E-02 | .97455E+00 | .48703E-01 | .14949E+00 | .27827E-01 | .13269E+01 | 07140 |
| .14000E+03 | .40934E-02 | | | | | 07150 |
| 0. | 0. | 0. | 0. | .29852E-01 | .55093E+01 | 07160 |
| .15354E-04 | .12555E-01 | .12974E-04 | .33262E-02 | .29862E-01 | .55786E+01 | 07170 |
| .32243E-04 | .26204E-01 | .58173E-04 | .68347E-02 | .29873E-01 | .56460E+01 | 07180 |
| .50668E-04 | .40918E-01 | .13905E-03 | .10489E-01 | .29881E-01 | .57166E+01 | 07190 |
| .71012E-04 | .56965E-01 | .26748E-03 | .14323E-01 | .29897E-01 | .57887E+01 | 07200 |
| .93559E-04 | .74602E-01 | .45199E-03 | .18351E-01 | .29902E-01 | .58619E+01 | 07210 |
| .11661E-03 | .93780E-01 | .70453E-03 | .22511E-01 | .29923E-01 | .59345E+01 | 07220 |
| .14586E-03 | .11445E+00 | .10326E-02 | .26736E-01 | .29925E-01 | .60048E+01 | 07230 |
| .16083E-03 | .12569E+00 | .12336E-02 | .28922E-01 | .29935E-01 | .60395E+01 | 07240 |
| .17580E-03 | .13686E+00 | .14490E-02 | .31014E-01 | .29938E-01 | .60716E+01 | 07250 |
| .19231E-03 | .14908E+00 | .17014E-02 | .33215E-01 | .29948E-01 | .61040E+01 | 07260 |
| .20881E-03 | .16123E+00 | .19696E-02 | .35309E-01 | .29952E-01 | .61334E+01 | 07270 |
| .24528E-03 | .18777E+00 | .26095E-02 | .39561E-01 | .29974E-01 | .61879E+01 | 07280 |
| .28558E-03 | .21670E+00 | .33897E-02 | .43698E-01 | .29976E-01 | .62324E+01 | 07290 |
| .33011E-03 | .24821E+00 | .43169E-02 | .47619E-01 | .29998E-01 | .62633E+01 | 07300 |
| .37924E-03 | .28249E+00 | .54169E-02 | .51205E-01 | .29997E-01 | .62765E+01 | 07310 |
| .43337E-03 | .31972E+00 | .66881E-02 | .54315E-01 | .30015E-01 | .62671E+01 | 07320 |
| .49286E-03 | .36007E+00 | .81574E-02 | .56792E-01 | .30008E-01 | .62290E+01 | 07330 |
| .56234E-03 | .40650E+00 | .99204E-02 | .58537E-01 | .30019E-01 | .61497E+01 | 07340 |
| .63873E-03 | .45680E+00 | .11924E-01 | .59167E-01 | .30000E-01 | .60212E+01 | 07350 |
| .72317E-03 | .51153E+00 | .14164E-01 | .58471E-01 | .29994E-01 | .58307E+01 | 07360 |
| .81607E-03 | .57072E+00 | .16685E-01 | .56247E-01 | .29956E-01 | .55647E+01 | 07370 |
| .91740E-03 | .63399E+00 | .19462E-01 | .52381E-01 | .29925E-01 | .52100E+01 | 07380 |
| .10287E-02 | .70161E+00 | .22620E-01 | .46803E-01 | .29860E-01 | .47471E+01 | 07390 |
| .11512E-02 | .77290E+00 | .26213E-01 | .39612E-01 | .29787E-01 | .41588E+01 | 07400 |
| .12859E-02 | .84561E+00 | .30454E-01 | .31238E-01 | .29672E-01 | .34386E+01 | 07410 |

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| .14341E-02 | .91380E+00 | .35317E-01 | .22803E-01 | .29515E-01 | .26209E+01 | 07420 |
| .15880E-02 | .96254E+00 | .39959E-01 | .16950E-01 | .29277E-01 | .18926E+01 | 07430 |
| .17419E-02 | .98280E+00 | .42296E-01 | .15988E-01 | .28927E-01 | .14763E+01 | 07440 |
| .18958E-02 | .98440E+00 | .42689E-01 | .19901E-01 | .28562E-01 | .13700E+01 | 07450 |
| .20498E-02 | .98319E+00 | .42457E-01 | .26647E-01 | .28154E-01 | .13791E+01 | 07460 |
| .22033E-02 | .98385E+00 | .42416E-01 | .33926E-01 | .27789E-01 | .13702E+01 | 07470 |
| .23568E-02 | .98387E+00 | .43003E-01 | .41752E-01 | .27402E-01 | .13576E+01 | 07480 |
| .25104E-02 | .98382E+00 | .43633E-01 | .49835E-01 | .27036E-01 | .13488E+01 | 07490 |
| .26639E-02 | .98379E+00 | .44693E-01 | .57870E-01 | .26681E-01 | .13383E+01 | 07500 |
| .28175E-02 | .98359E+00 | .45869E-01 | .65981E-01 | .26328E-01 | .13287E+01 | 07510 |
| .29710E-02 | .98334E+00 | .47375E-01 | .74040E-01 | .26011E-01 | .13191E+01 | 07520 |
| .31207E-02 | .98300E+00 | .48970E-01 | .81949E-01 | .25690E-01 | .13102E+01 | 07530 |
| .32551E-02 | .98262E+00 | .50614E-01 | .88975E-01 | .25447E-01 | .13025E+01 | 07540 |
| .33740E-02 | .98223E+00 | .52130E-01 | .95228E-01 | .25214E-01 | .12958E+01 | 07550 |
| .34815E-02 | .98184E+00 | .53601E-01 | .10082E+00 | .25044E-01 | .12900E+01 | 07560 |
| .35775E-02 | .98147E+00 | .54898E-01 | .10581E+00 | .24873E-01 | .12846E+01 | 07570 |
| .36658E-02 | .98110E+00 | .56136E-01 | .11033E+00 | .24756E-01 | .12799E+01 | 07580 |
| .37464E-02 | .98077E+00 | .57158E-01 | .11441E+00 | .24624E-01 | .12754E+01 | 07590 |
| .38193E-02 | .98046E+00 | .58122E-01 | .11795E+00 | .24561E-01 | .12716E+01 | 07600 |
| .38846E-02 | .98022E+00 | .58729E-01 | .12094E+00 | .24457E-01 | .12679E+01 | 07610 |
| .39437E-02 | .97999E+00 | .59456E-01 | .12334E+00 | .24475E-01 | .12656E+01 | 07620 |
| .39974E-02 | .97990E+00 | .59394E-01 | .12519E+00 | .24317E-01 | .12623E+01 | 07630 |
| .40473E-02 | .97964E+00 | .60584E-01 | .12625E+00 | .24616E-01 | .12635E+01 | 07640 |
| .40934E-02 | .98017E+00 | .57195E-01 | .12700E+00 | .23638E-01 | .12543E+01 | 07650 |
| .15000E+03 | .42573E-02 | | | | | 07660 |
| 0. | 0. | 0. | 0. | .27786E-01 | .55093E+01 | 07670 |
| .15969E-04 | .12552E-01 | .13652E-04 | .25618E-02 | .27795E-01 | .55754E+01 | 07680 |
| .33534E-04 | .26201E-01 | .61399E-04 | .52642E-02 | .27807E-01 | .56437E+01 | 07690 |
| .52697E-04 | .40913E-01 | .14680E-03 | .80792E-02 | .27815E-01 | .57132E+01 | 07700 |
| .73855E-04 | .56959E-01 | .28258E-03 | .11032E-01 | .27831E-01 | .57841E+01 | 07710 |
| .97409E-04 | .74596E-01 | .47774E-03 | .14136E-01 | .27836E-01 | .58562E+01 | 07720 |
| .12336E-03 | .93772E-01 | .74516E-03 | .17341E-01 | .27858E-01 | .59277E+01 | 07730 |
| .15170E-03 | .11444E+00 | .10929E-02 | .20596E-01 | .27859E-01 | .59968E+01 | 07740 |
| .16727E-03 | .12568E+00 | .13061E-02 | .22280E-01 | .27869E-01 | .60309E+01 | 07750 |
| .18284E-03 | .13684E+00 | .15349E-02 | .23891E-01 | .27872E-01 | .60625E+01 | 07760 |
| .20001E-03 | .14906E+00 | .18031E-02 | .25587E-01 | .27881E-01 | .60943E+01 | 07770 |
| .21717E-03 | .16120E+00 | .20882E-02 | .27200E-01 | .27885E-01 | .61232E+01 | 07780 |
| .25510E-03 | .18772E+00 | .27696E-02 | .30476E-01 | .27907E-01 | .61765E+01 | 07790 |
| .29702E-03 | .21662E+00 | .36022E-02 | .33662E-01 | .27907E-01 | .62198E+01 | 07800 |
| .34333E-03 | .24809E+00 | .45941E-02 | .36682E-01 | .27927E-01 | .62495E+01 | 07810 |
| .39443E-03 | .28230E+00 | .57750E-02 | .39443E-01 | .27923E-01 | .62615E+01 | 07820 |
| .45072E-03 | .31944E+00 | .71449E-02 | .41836E-01 | .27938E-01 | .62507E+01 | 07830 |
| .51260E-03 | .35967E+00 | .87365E-02 | .43741E-01 | .27926E-01 | .62114E+01 | 07840 |
| .58485E-03 | .40593E+00 | .10658E-01 | .45080E-01 | .27932E-01 | .61309E+01 | 07850 |

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|---|---|---|---|---|---|---|
| .66430E-03 | .45601E+00 | .12858E-01 | .45559E-01 | .27905E-01 | .60013E+01 | 07860 |
| .75213E-03 | .51048E+00 | .15341E-01 | .45014E-01 | .27893E-01 | .58104E+01 | 07870 |
| .84874E-03 | .56936E+00 | .18165E-01 | .43292E-01 | .27846E-01 | .55448E+01 | 07880 |
| .95413E-03 | .63230E+00 | .21308E-01 | .40304E-01 | .27806E-01 | .51917E+01 | 07890 |
| .10699E-02 | .69962E+00 | .24919E-01 | .35996E-01 | .27730E-01 | .47321E+01 | 07900 |
| .11973E-02 | .77071E+00 | .29051E-01 | .30444E-01 | .27646E-01 | .41488E+01 | 07910 |
| .13374E-02 | .84349E+00 | .33935E-01 | .23966E-01 | .27519E-01 | .34340E+01 | 07920 |
| .14915E-02 | .91232E+00 | .39516E-01 | .17395E-01 | .27344E-01 | .26181E+01 | 07930 |
| .16516E-02 | .96237E+00 | .44898E-01 | .12726E-01 | .27083E-01 | .18808E+01 | 07940 |
| .18117E-02 | .98376E+00 | .47754E-01 | .11783E-01 | .26691E-01 | .14496E+01 | 07950 |
| .19717E-02 | .98574E+00 | .48350E-01 | .14640E-01 | .26280E-01 | .13340E+01 | 07960 |
| .21318E-02 | .98460E+00 | .48195E-01 | .19806E-01 | .25829E-01 | .13411E+01 | 07970 |
| .22915E-02 | .98547E+00 | .48216E-01 | .25462E-01 | .25426E-01 | .13302E+01 | 07980 |
| .24512E-02 | .98569E+00 | .48891E-01 | .31604E-01 | .25005E-01 | .13153E+01 | 07990 |
| .26109E-02 | .98584E+00 | .49610E-01 | .38010E-01 | .24601E-01 | .13049E+01 | 08000 |
| .27706E-02 | .98603E+00 | .50778E-01 | .44399E-01 | .24211E-01 | .12930E+01 | 08010 |
| .29303E-02 | .98605E+00 | .52081E-01 | .50879E-01 | .23819E-01 | .12820E+01 | 08020 |
| .30899E-02 | .98605E+00 | .53720E-01 | .57327E-01 | .23461E-01 | .12714E+01 | 08030 |
| .32456E-02 | .98595E+00 | .55469E-01 | .63673E-01 | .23095E-01 | .12615E+01 | 08040 |
| .33854E-02 | .98581E+00 | .57245E-01 | .69312E-01 | .22807E-01 | .12531E+01 | 08050 |
| .35091E-02 | .98565E+00 | .58892E-01 | .74336E-01 | .22532E-01 | .12457E+01 | 08060 |
| .36209E-02 | .98547E+00 | .60461E-01 | .78822E-01 | .22315E-01 | .12392E+01 | 08070 |
| .37207E-02 | .98530E+00 | .61855E-01 | .82834E-01 | .22102E-01 | .12334E+01 | 08080 |
| .38125E-02 | .98512E+00 | .63147E-01 | .86465E-01 | .21936E-01 | .12281E+01 | 08090 |
| .38964E-02 | .98497E+00 | .64231E-01 | .89739E-01 | .21767E-01 | .12230E+01 | 08100 |
| .39722E-02 | .98483E+00 | .65191E-01 | .92583E-01 | .21651E-01 | .12186E+01 | 08110 |
| .40401E-02 | .98474E+00 | .65837E-01 | .94987E-01 | .21521E-01 | .12144E+01 | 08120 |
| .41016E-02 | .98464E+00 | .66485E-01 | .96917E-01 | .21476E-01 | .12113E+01 | 08130 |
| .41575E-02 | .98465E+00 | .66485E-01 | .98391E-01 | .21325E-01 | .12077E+01 | 08140 |
| .42094E-02 | .98447E+00 | .67536E-01 | .99243E-01 | .21532E-01 | .12080E+01 | 08150 |
| .42573E-02 | .98530E+00 | .62932E-01 | .99882E-01 | .20368E-01 | .11950E+01 | 08160 |
| .16000E+03 | .43790E-02 | | | | | 08170 |
| 0. | 0. | 0. | 0. | .26371E-01 | .55093E+01 | 08180 |
| .16425E-04 | .12572E-01 | .14091E-04 | .17400E-02 | .26380E-01 | .55747E+01 | 08190 |
| .34493E-04 | .26241E-01 | .63504E-04 | .35756E-02 | .26392E-01 | .56422E+01 | 08200 |
| .54204E-04 | .40977E-01 | .15184E-03 | .54877E-02 | .26400E-01 | .57110E+01 | 08210 |
| .75967E-04 | .57049E-01 | .29241E-03 | .74935E-02 | .26416E-01 | .57812E+01 | 08220 |
| .10019E-03 | .74713E-01 | .49448E-03 | .96015E-02 | .26421E-01 | .58525E+01 | 08230 |
| .12689E-03 | .93519E-01 | .77154E-03 | .11778E-01 | .26440E-01 | .59233E+01 | 08240 |
| .15604E-03 | .11462E+00 | .11320E-02 | .13988E-01 | .26444E-01 | .59917E+01 | 08250 |
| .17206E-03 | .12587E+00 | .13532E-02 | .15132E-01 | .26453E-01 | .60254E+01 | 08260 |
| .18807E-03 | .13705E+00 | .15906E-02 | .16226E-01 | .26456E-01 | .60566E+01 | 08270 |
| .20573E-03 | .14928E+00 | .18690E-02 | .17377E-01 | .26465E-01 | .60881E+01 | 08280 |
| .22338E-03 | .16143E+00 | .21652E-02 | .18472E-01 | .26468E-01 | .61165E+01 | 08290 |

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|---|---|---|---|---|---|---|
| .26239E-03 | .18798E+00 | .28734E-02 | .20696E-01 | .26490E-01 | .61691E+01 | 08300 |
| .30551E-03 | .21690E+00 | .37402E-02 | .22858E-01 | .26488E-01 | .62115E+01 | 08310 |
| .35314E-03 | .24838E+00 | .47744E-02 | .24906E-01 | .26508E-01 | .62402E+01 | 08320 |
| .40571E-03 | .28259E+00 | .60086E-02 | .26778E-01 | .26500E-01 | .62511E+01 | 08330 |
| .46360E-03 | .31971E+00 | .74439E-02 | .28400E-01 | .26514E-01 | .62391E+01 | 08340 |
| .52725E-03 | .35989E+00 | .91173E-02 | .29688E-01 | .26498E-01 | .61985E+01 | 08350 |
| .60158E-03 | .40608E+00 | .11146E-01 | .30591E-01 | .26501E-01 | .61165E+01 | 08360 |
| .68329E-03 | .45604E+00 | .13482E-01 | .30908E-01 | .26468E-01 | .59856E+01 | 08370 |
| .77363E-03 | .51036E+00 | .16134E-01 | .30529E-01 | .26451E-01 | .57935E+01 | 08380 |
| .87301E-03 | .56905E+00 | .19173E-01 | .29349E-01 | .26397E-01 | .55272E+01 | 08390 |
| .98141E-03 | .63176E+00 | .22580E-01 | .27310E-01 | .26351E-01 | .51743E+01 | 08400 |
| .11005E-02 | .69885E+00 | .26522E-01 | .24377E-01 | .26268E-01 | .47161E+01 | 08410 |
| .12315E-02 | .76974E+00 | .31054E-01 | .20599E-01 | .26178E-01 | .41355E+01 | 08420 |
| .13756E-02 | .84248E+00 | .36422E-01 | .16191E-01 | .26042E-01 | .34244E+01 | 08430 |
| .15341E-02 | .91161E+00 | .42545E-01 | .11704E-01 | .25857E-01 | .26106E+01 | 08440 |
| .16988E-02 | .96238E+00 | .48483E-01 | .84724E-02 | .25581E-01 | .18692E+01 | 08450 |
| .18635E-02 | .98444E+00 | .51734E-01 | .77477E-02 | .25163E-01 | .14295E+01 | 08460 |
| .20281E-02 | .98667E+00 | .52493E-01 | .96154E-02 | .24718E-01 | .13082E+01 | 08470 |
| .21928E-02 | .98558E+00 | .52397E-01 | .13103E-01 | .24241E-01 | .13138E+01 | 08480 |
| .23570E-02 | .98661E+00 | .52465E-01 | .16964E-01 | .23812E-01 | .13015E+01 | 08490 |
| .25213E-02 | .98699E+00 | .53196E-01 | .21187E-01 | .23367E-01 | .12849E+01 | 08500 |
| .26855E-02 | .98729E+00 | .53967E-01 | .25626E-01 | .22939E-01 | .12734E+01 | 08510 |
| .28498E-02 | .98765E+00 | .55197E-01 | .30066E-01 | .22525E-01 | .12604E+01 | 08520 |
| .30140E-02 | .98786E+00 | .56574E-01 | .34587E-01 | .22105E-01 | .12486E+01 | 08530 |
| .31783E-02 | .98805E+00 | .58289E-01 | .39091E-01 | .21719E-01 | .12372E+01 | 08540 |
| .33384E-02 | .98817E+00 | .60128E-01 | .43536E-01 | .21321E-01 | .12267E+01 | 08550 |
| .34822E-02 | .98823E+00 | .61976E-01 | .47485E-01 | .21000E-01 | .12177E+01 | 08560 |
| .36095E-02 | .98826E+00 | .63696E-01 | .51008E-01 | .20692E-01 | .12099E+01 | 08570 |
| .37244E-02 | .98826E+00 | .65314E-01 | .54151E-01 | .20441E-01 | .12030E+01 | 08580 |
| .38271E-02 | .98826E+00 | .66752E-01 | .56963E-01 | .20196E-01 | .11967E+01 | 08590 |
| .39215E-02 | .98825E+00 | .68059E-01 | .59508E-01 | .19994E-01 | .11910E+01 | 08600 |
| .40078E-02 | .98826E+00 | .69160E-01 | .61801E-01 | .19792E-01 | .11855E+01 | 08610 |
| .40858E-02 | .98827E+00 | .70092E-01 | .63795E-01 | .19639E-01 | .11805E+01 | 08620 |
| .41556E-02 | .98831E+00 | .70739E-01 | .65478E-01 | .19484E-01 | .11758E+01 | 08630 |
| .42188E-02 | .98834E+00 | .71293E-01 | .66832E-01 | .19393E-01 | .11720E+01 | 08640 |
| .42763E-02 | .98843E+00 | .71353E-01 | .67854E-01 | .19249E-01 | .11681E+01 | 08650 |
| .43297E-02 | .98836E+00 | .72088E-01 | .68461E-01 | .19346E-01 | .11672E+01 | 08660 |
| .43790E-02 | .98952E+00 | .66156E-01 | .68938E-01 | .18005E-01 | .11501E+01 | 08670 |
| .17000E+03 | .44530E-02 | | | | | 08680 |
| 0. | 0. | 0. | 0. | .25545E-01 | .55093E+01 | 08690 |
| .16703E-04 | .12590E-01 | .14288E-04 | .87558E-03 | .25554E-01 | .55743E+01 | 08700 |
| .35076E-04 | .26281E-01 | .64494E-04 | .17995E-02 | .25566E-01 | .56414E+01 | 08710 |
| .55120E-04 | .41038E-01 | .15421E-03 | .27622E-02 | .25574E-01 | .57098E+01 | 08720 |
| .77251E-04 | .57134E-01 | .29707E-03 | .37724E-02 | .25590E-01 | .57795E+01 | 08730 |

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|---|---|---|---|---|---|---|
| .10189E-03 | .74825E-01 | .50246E-03 | .48346E-02 | .25595E-01 | .58505E+01 | 08740 |
| .12903E-03 | .94058E-01 | .78421E-03 | .59316E-02 | .25617E-01 | .59208E+01 | 08750 |
| .15868E-03 | .11478E+00 | .11510E-02 | .70463E-02 | .25617E-01 | .59888E+01 | 08760 |
| .17496E-03 | .12605E+00 | .13761E-02 | .76230E-02 | .25626E-01 | .60224E+01 | 08770 |
| .19125E-03 | .13724E+00 | .16178E-02 | .81753E-02 | .25629E-01 | .60533E+01 | 08780 |
| .20921E-03 | .14950E+00 | .19013E-02 | .87564E-02 | .25638E-01 | .60846E+01 | 08790 |
| .22716E-03 | .16166E+00 | .22031E-02 | .93091E-02 | .25641E-01 | .61128E+01 | 08800 |
| .25683E-03 | .18824E+00 | .29251E-02 | .10432E-01 | .25662E-01 | .61648E+01 | 08810 |
| .31068E-03 | .21718E+00 | .38097E-02 | .11525E-01 | .25660E-01 | .62066E+01 | 08820 |
| .35911E-03 | .24868E+00 | .48664E-02 | .12560E-01 | .25679E-01 | .62348E+01 | 08830 |
| .41256E-03 | .28290E+00 | .61294E-02 | .13507E-01 | .25670E-01 | .62449E+01 | 08840 |
| .47144E-03 | .32002E+00 | .76007E-02 | .14328E-01 | .25682E-01 | .62321E+01 | 08850 |
| .53617E-03 | .36019E+00 | .93203E-02 | .14981E-01 | .25664E-01 | .61906E+01 | 08860 |
| .61175E-03 | .40635E+00 | .11410E-01 | .15438E-01 | .25665E-01 | .61076E+01 | 08870 |
| .69484E-03 | .45625E+00 | .13826E-01 | .15599E-01 | .25629E-01 | .59757E+01 | 08880 |
| .78671E-03 | .51047E+00 | .16577E-01 | .15407E-01 | .25609E-01 | .57826E+01 | 08890 |
| .88776E-03 | .56904E+00 | .19746E-01 | .14809E-01 | .25552E-01 | .55157E+01 | 08900 |
| .99800E-03 | .63161E+00 | .23313E-01 | .13776E-01 | .25503E-01 | .51627E+01 | 08910 |
| .11191E-02 | .69854E+00 | .27457E-01 | .12290E-01 | .25416E-01 | .47051E+01 | 08920 |
| .12523E-02 | .76929E+00 | .32236E-01 | .10377E-01 | .25323E-01 | .41262E+01 | 08930 |
| .13989E-02 | .84196E+00 | .37902E-01 | .81461E-02 | .25183E-01 | .34173E+01 | 08940 |
| .15601E-02 | .91122E+00 | .44362E-01 | .58730E-02 | .24992E-01 | .26053E+01 | 08950 |
| .17275E-02 | .96240E+00 | .50648E-01 | .42266E-02 | .24709E-01 | .18619E+01 | 08960 |
| .18950E-02 | .98484E+00 | .54151E-01 | .38406E-02 | .24277E-01 | .14174E+01 | 08970 |
| .20624E-02 | .98721E+00 | .55020E-01 | .47644E-02 | .23814E-01 | .12928E+01 | 08980 |
| .22299E-02 | .98615E+00 | .54966E-01 | .65181E-02 | .23321E-01 | .12975E+01 | 08990 |
| .23969E-02 | .98729E+00 | .55064E-01 | .84711E-02 | .22878E-01 | .12843E+01 | 09000 |
| .25639E-02 | .98775E+00 | .55828E-01 | .10620E-01 | .22421E-01 | .12667E+01 | 09010 |
| .27309E-02 | .98815E+00 | .56627E-01 | .12890E-01 | .21979E-01 | .12545E+01 | 09020 |
| .28980E-02 | .98863E+00 | .57889E-01 | .15166E-01 | .21551E-01 | .12409E+01 | 09030 |
| .30650E-02 | .98895E+00 | .59304E-01 | .17490E-01 | .21116E-01 | .12286E+01 | 09040 |
| .32320E-02 | .98928E+00 | .61055E-01 | .19808E-01 | .20713E-01 | .12168E+01 | 09050 |
| .33949E-02 | .98954E+00 | .62939E-01 | .22100E-01 | .20296E-01 | .12059E+01 | 09060 |
| .35410E-02 | .98974E+00 | .64821E-01 | .24136E-01 | .19955E-01 | .11966E+01 | 09070 |
| .36705E-02 | .98989E+00 | .66572E-01 | .25954E-01 | .19628E-01 | .11885E+01 | 09080 |
| .37874E-02 | .99002E+00 | .68207E-01 | .27575E-01 | .19355E-01 | .11813E+01 | 09090 |
| .38918E-02 | .99014E+00 | .69658E-01 | .29026E-01 | .19088E-01 | .11747E+01 | 09100 |
| .39878E-02 | .99025E+00 | .70958E-01 | .30338E-01 | .18863E-01 | .11686E+01 | 09110 |
| .40755E-02 | .99037E+00 | .72050E-01 | .31520E-01 | .18640E-01 | .11628E+01 | 09120 |
| .41549E-02 | .99049E+00 | .72946E-01 | .32548E-01 | .18461E-01 | .11574E+01 | 09130 |
| .42259E-02 | .99062E+00 | .73572E-01 | .33415E-01 | .18289E-01 | .11524E+01 | 09140 |
| .42902E-02 | .99073E+00 | .74050E-01 | .34113E-01 | .18169E-01 | .11481E+01 | 09150 |
| .43486E-02 | .99088E+00 | .74143E-01 | .34636E-01 | .18027E-01 | .11440E+01 | 09160 |
| .44029E-02 | .99092E+00 | .74514E-01 | .34955E-01 | .18028E-01 | .11418E+01 | 09170 |

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|---|---|---|---|---|---|---|
| .44530E-02 | .59234E+00 | .67481E-01 | .35211E-01 | .16555E-01 | .11213E+01 | 09180 |
| .18000E+03 | .44779E-02 | | | | | 09190 |
| 0. | 0. | 0. | 0. | .25278E-01 | .55093E+01 | 09200 |
| .16796E-04 | .12597E-01 | .14386E-04 | -.22785E-16 | .25288E-01 | .55741E+01 | 09210 |
| .35272E-04 | .26295E-01 | .64953E-04 | -.47625E-16 | .25300E-01 | .56411E+01 | 09220 |
| .55427E-04 | .41061E-01 | .15531E-03 | -.74483E-16 | .25307E-01 | .57094E+01 | 09230 |
| .77682E-04 | .57165E-01 | .29919E-03 | -.10389E-15 | .25324E-01 | .57790E+01 | 09240 |
| .10246E-03 | .74865E-01 | .50605E-03 | -.13636E-15 | .25328E-01 | .58498E+01 | 09250 |
| .12975E-03 | .94109E-01 | .78983E-03 | -.17191E-15 | .25350E-01 | .59201E+01 | 09260 |
| .15956E-03 | .11485E+00 | .11592E-02 | -.21056E-15 | .25350E-01 | .59879E+01 | 09270 |
| .17594E-03 | .12612E+00 | .13860E-02 | -.23176E-15 | .25360E-01 | .60214E+01 | 09280 |
| .19232E-03 | .13732E+00 | .16295E-02 | -.25297E-15 | .25362E-01 | .60523E+01 | 09290 |
| .21037E-03 | .14957E+00 | .19151E-02 | -.27638E-15 | .25371E-01 | .60834E+01 | 09300 |
| .22843E-03 | .16174E+00 | .22192E-02 | -.29986E-15 | .25374E-01 | .61116E+01 | 09310 |
| .26832E-03 | .18833E+00 | .29466E-02 | -.35204E-15 | .25395E-01 | .61634E+01 | 09320 |
| .31241E-03 | .21729E+00 | .38380E-02 | -.41065E-15 | .25392E-01 | .62051E+01 | 09330 |
| .36112E-03 | .24879E+00 | .49030E-02 | -.47711E-15 | .25411E-01 | .62330E+01 | 09340 |
| .41487E-03 | .28302E+00 | .61766E-02 | -.55341E-15 | .25401E-01 | .62429E+01 | 09350 |
| .47407E-03 | .32014E+00 | .76606E-02 | -.64233E-15 | .25413E-01 | .62298E+01 | 09360 |
| .53916E-03 | .36031E+00 | .93962E-02 | -.74793E-15 | .25394E-01 | .61880E+01 | 09370 |
| .61516E-03 | .40646E+00 | .11507E-01 | -.88501E-15 | .25394E-01 | .61047E+01 | 09380 |
| .69872E-03 | .45634E+00 | .13949E-01 | -.10589E-14 | .25357E-01 | .59724E+01 | 09390 |
| .79110E-03 | .51054E+00 | .16734E-01 | -.12896E-14 | .25337E-01 | .57790E+01 | 09400 |
| .89272E-03 | .56907E+00 | .19944E-01 | -.16094E-14 | .25278E-01 | .55118E+01 | 09410 |
| .10036E-02 | .63160E+00 | .23564E-01 | -.20733E-14 | .25228E-01 | .51587E+01 | 09420 |
| .11253E-02 | .69848E+00 | .27775E-01 | -.27963E-14 | .25140E-01 | .47013E+01 | 09430 |
| .12593E-02 | .76918E+00 | .32634E-01 | -.40190E-14 | .25045E-01 | .41228E+01 | 09440 |
| .14067E-02 | .84183E+00 | .38399E-01 | -.63143E-14 | .24903E-01 | .34147E+01 | 09450 |
| .15688E-02 | .91113E+00 | .44971E-01 | -.11218E-13 | .24711E-01 | .26031E+01 | 09460 |
| .17371E-02 | .96242E+00 | .51374E-01 | -.22401E-13 | .24425E-01 | .18591E+01 | 09470 |
| .19055E-02 | .98498E+00 | .54963E-01 | -.47129E-13 | .23989E-01 | .14132E+01 | 09480 |
| .20739E-02 | .98738E+00 | .55869E-01 | -.96598E-13 | .23519E-01 | .12877E+01 | 09490 |
| .22423E-02 | .98634E+00 | .55830E-01 | -.17284E-12 | .23022E-01 | .12922E+01 | 09500 |
| .24103E-02 | .98751E+00 | .55940E-01 | -.26035E-12 | .22575E-01 | .12787E+01 | 09510 |
| .25782E-02 | .98801E+00 | .56714E-01 | -.35706E-12 | .22113E-01 | .12607E+01 | 09520 |
| .27462E-02 | .98844E+00 | .57521E-01 | -.46073E-12 | .21667E-01 | .12482E+01 | 09530 |
| .29141E-02 | .98895E+00 | .58793E-01 | -.56976E-12 | .21234E-01 | .12344E+01 | 09540 |
| .30821E-02 | .98932E+00 | .60218E-01 | -.68714E-12 | .20794E-01 | .12219E+01 | 09550 |
| .32501E-02 | .98970E+00 | .61979E-01 | -.81307E-12 | .20385E-01 | .12100E+01 | 09560 |
| .34138E-02 | .99000E+00 | .63873E-01 | -.94721E-12 | .19961E-01 | .11989E+01 | 09570 |
| .35608E-02 | .99025E+00 | .65764E-01 | -.10770E-11 | .19614E-01 | .11895E+01 | 09580 |
| .36910E-02 | .99045E+00 | .67522E-01 | -.12019E-11 | .19279E-01 | .11813E+01 | 09590 |
| .38085E-02 | .99063E+00 | .69159E-01 | -.13223E-11 | .18998E-01 | .11740E+01 | 09600 |
| .39135E-02 | .99079E+00 | .70608E-01 | -.14376E-11 | .18724E-01 | .11674E+01 | 09610 |

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.40101E-02  .99094E+00  .71899E-01 -.15497E-11  .18489E-01  .11611E+01   09620
.40983E-02  .99110E+00  .72982E-01 -.16578E-11  .18258E-01  .11552E+01   09630
.41780E-02  .99126E+00  .73960E-01 -.17592E-11  .18070E-01  .11497E+01   09640
.42494E-02  .99142E+00  .74472E-01 -.18523E-11  .17891E-01  .11445E+01   09650
.43141E-02  .99157E+00  .74919E-01 -.19363E-11  .17761E-01  .11400E+01   09660
.43729E-02  .99173E+00  .75022E-01 -.20103E-11  .17620E-01  .11357E+01   09670
.44275E-02  .99182E+00  .75226E-01 -.20729E-11  .17582E-01  .11330E+01   09680
.44779E-02  .99334E+00  .67750E-01 -.21221E-11  .16059E-01  .11111E+01   09690
      .040        .0412
        1
        1          0.        5.5093
       11          0.        5.5093
       19
        1          0.        5.5093
       11          0.        5.5093
```

# APPENDIX E

# OUTPUT FROM TRACY'S CASE

```
$INPUT
GAMMA   =  0.14E+01,
MINF    =  0.8E+01,
THETAC  =  0.1E+02,
REINF   =  0.1113E+07,
PRINF   =  0.75E+00,
ALFA    =  0.22E+02,
PINF    =  0.1116E-01,
SPROP   =  0.2E+01,
MJ      =  11,
MK      =  53,
ML      =  19,
MOD     = F,
ITAPE   =  0,
$END
0.          0.          0.          0.          .12099E+00  .59893E+01
 .68366E-05  .16511E-01 -.10453E-04 -.65041E-68  .13997E+00  .56204E+01
 .10357E-04  .34378E-01 -.45701E-04 -.13525E-67  .13895E+00  .57347E+01
 .22561E-04  .53551E-01 -.11051E-03 -.21008E-67  .13993E+00  .58586E+01
 .31619E-04  .74374E-01 -.21376E-03 -.29025E-67  .13890E+00  .59683E+01
 .41703E-04  .97173E-01 -.36436E-03 -.37615E-67  .13888E+00  .60877E+01
 .52813E-04  .12188E+00 -.57152E-03 -.46619E-67  .13885E+00  .62056E+01
 .64948E-04  .14842E+00 -.85010E-03 -.55823E-67  .13883E+00  .63191E+01
 .71613E-04  .16283E+00 -.10215E-02 -.60572E-67  .13881E+00  .63750E+01
 .78279E-04  .17713E+00 -.12084E-02 -.65030E-67  .13880E+00  .64264E+01
 .85628E-04  .19277E+00 -.14251E-02 -.69791E-67  .13878E+00  .64781E+01
 .92978E-04  .20829E+00 -.16591E-02 -.74183E-67  .13877E+00  .65246E+01
 .10921E-03  .24218E+00 -.22250E-02 -.82749E-67  .13873E+00  .66095E+01
 .12716E-03  .27905E+00 -.29251E-02 -.90253E-67  .13872E+00  .66758E+01
```

| | | | | | |
|---|---|---|---|---|---|
| .14699E-03 | .31915E+00 | -.37731E-02 | -.96011E-67 | .13868E+00 | .67170E+01 |
| .16886E-03 | .36269E+00 | -.47895E-02 | -.99173E-67 | .13867E+00 | .67248E+01 |
| .19296E-03 | .40983E+00 | -.59814E-02 | -.98762E-67 | .13864E+00 | .66895E+01 |
| .21945E-03 | .46065E+00 | -.73607E-02 | -.93755E-67 | .13864E+00 | .65998E+01 |
| .25039E-03 | .51858E+00 | -.90135E-02 | -.82376E-67 | .13864E+00 | .64308E+01 |
| .28443E-03 | .58030E+00 | -.10845E-01 | -.64159E-67 | .13867E+00 | .61710E+01 |
| .32200E-03 | .64562E+00 | -.12801E-01 | -.39199E-67 | .13870E+00 | .58025E+01 |
| .36336E-03 | .71305E+00 | -.14809E-01 | -.94423E-68 | .13877E+00 | .53154E+01 |
| .40849E-03 | .77977E+00 | -.16703E-01 | .20582E-67 | .13885E+00 | .47158E+01 |
| .45805E-03 | .84234E+00 | -.18413E-01 | .44132E-67 | .13895E+00 | .40278E+01 |
| .51257E-03 | .89485E+00 | -.19914E-01 | .53112E-67 | .13901E+00 | .33245E+01 |
| .57256E-03 | .93053E+00 | -.21556E-01 | .43963E-67 | .13901E+00 | .27343E+01 |
| .63854E-03 | .94669E+00 | -.23865E-01 | .24874E-67 | .13888E+00 | .23850E+01 |
| .71707E-03 | .94833E+00 | -.26883E-01 | .11602E-67 | .13860E+00 | .22954E+01 |
| .77561E-03 | .94591E+00 | -.30499E-01 | .74311E-68 | .13811E+00 | .23284E+01 |
| .84415E-03 | .94419E+00 | -.34437E-01 | .59732E-68 | .13752E+00 | .23698E+01 |
| .91268E-03 | .94280E+00 | -.38344E-01 | .50643E-68 | .13680E+00 | .24021E+01 |
| .98105E-03 | .94138E+00 | -.42334E-01 | .45879E-68 | .13600E+00 | .24324E+01 |
| .10494E-02 | .93999E+00 | -.46323E-01 | .40865E-68 | .13509E+00 | .24616E+01 |
| .11178E-02 | .93861E+00 | -.50386E-01 | .34991E-68 | .13405E+00 | .24900E+01 |
| .11861E-02 | .93723E+00 | -.34438E-01 | .28543E-68 | .13300E+00 | .25181E+01 |
| .12545E-02 | .93583E+00 | -.58558E-01 | .22180E-68 | .13180E+00 | .25457E+01 |
| .13229E-02 | .93444E+00 | -.62657E-01 | .16522E-68 | .13055E+00 | .25729E+01 |
| .13895E-02 | .93309E+00 | -.66718E-01 | .11806E-68 | .12918E+00 | .25986E+01 |
| .14494E-02 | .93189E+00 | -.70331E-01 | .84876E-69 | .12794E+00 | .26208E+01 |
| .15023E-02 | .93085E+00 | -.73570E-01 | .60151E-69 | .12672E+00 | .26396E+01 |
| .15502E-02 | .92994E+00 | -.76472E-01 | .41966E-69 | .12562E+00 | .26558E+01 |
| .15929E-02 | .92915E+00 | -.79099E-01 | .28880E-69 | .12453E+00 | .26693E+01 |
| .16322E-02 | .92846E+00 | -.81465E-01 | .19453E-69 | .12356E+00 | .26818E+01 |
| .16681E-02 | .92785E+00 | -.83679E-01 | .12940E-69 | .12256E+00 | .26906E+01 |
| .17006E-02 | .92734E+00 | -.85610E-01 | .87313E-70 | .12172E+00 | .26986E+01 |
| .17297E-02 | .92692E+00 | -.87420E-01 | .60146E-70 | .12082E+00 | .27047E+01 |
| .17560E-02 | .92656E+00 | -.88942E-01 | .43429E-70 | .12015E+00 | .27096E+01 |
| .17799E-02 | .92628E+00 | -.90485E-01 | .30048E-70 | .11930E+00 | .27129E+01 |
| .18021E-02 | .92604E+00 | -.91654E-01 | .19667E-70 | .11884E+00 | .27157E+01 |
| .18226E-02 | .92588E+00 | -.93178E-01 | 0. | .11781E+00 | .27184E+01 |
| 0. | 0. | 0. | 0. | .13688E+00 | .55093E+01 |
| .68899E-05 | .16426E-01 | -.10222E-04 | .10524E-02 | .13686E+00 | .56197E+01 |
| .14469E-04 | .34203E-01 | -.44706E-04 | .21939E-02 | .13684E+00 | .57333E+01 |
| .22737E-04 | .53280E-01 | -.19813E-03 | .32924E-02 | .13682E+00 | .58484E+01 |
| .31866E-04 | .74002E-01 | -.20919E-03 | .44769E-02 | .13680E+00 | .59655E+01 |
| .42028E-04 | .96631E-01 | -.35713E-03 | .57108E-02 | .13578E+00 | .60841E+01 |
| .53224E-04 | .12128E+00 | -.56211E-03 | .69727E-02 | .13575E+00 | .62814E+01 |

| | | | | | |
|---|---|---|---|---|---|
| .65454E-04 | .14770E+00 | -.83248E-03 | .92409E-02 | .13573E+00 | .63143E+01 |
| .72171E-04 | .16205E+00 | -.10004E-02 | .88914E-02 | .13571E+00 | .63700E+01 |
| .78889E-04 | .17628E+00 | -.11617E-02 | .95101E-02 | .13570E+00 | .64212E+01 |
| .86296E-04 | .19185E+00 | -.13962E-02 | .10156E-01 | .13568E+00 | .64726E+01 |
| .93702E-04 | .20730E+00 | -.16256E-02 | .10766E-01 | .13667E+00 | .65190E+01 |
| .11007E-03 | .24103E+00 | -.21813E-02 | .11909E-01 | .13664E+00 | .66035E+01 |
| .12815E-03 | .27774E+00 | -.28660E-02 | .13152E-01 | .13662E+00 | .66700E+01 |
| .14813E-03 | .31766E+00 | -.37009E-02 | .14222E-01 | .13650E+00 | .67115E+01 |
| .17018E-03 | .36104E+00 | -.47000E-02 | .15149E-01 | .13657E+00 | .67200E+01 |
| .19447E-03 | .40799E+00 | -.58728E-02 | .15917E-01 | .13655E+00 | .66859E+01 |
| .22117E-03 | .45862E+00 | -.72316E-02 | .16446E-01 | .13655E+00 | .65979E+01 |
| .25234E-03 | .51637E+00 | -.88024E-02 | .16590E-01 | .13655E+00 | .64316E+01 |
| .28662E-03 | .57792E+00 | -.10673E-01 | .16577E-01 | .13658E+00 | .61751E+01 |
| .32451E-03 | .64313E+00 | -.12612E-01 | .16050E-01 | .13662E+00 | .58108E+01 |
| .36620E-03 | .71054E+00 | -.14664E-01 | .15033E-01 | .13669E+00 | .53288E+01 |
| .41167E-03 | .77740E+00 | -.16499E-01 | .13632E-01 | .13677E+00 | .47320E+01 |
| .46162E-03 | .84033E+00 | -.18211E-01 | .11958E-01 | .13688E+00 | .40455E+01 |
| .51657E-03 | .89348E+00 | -.19711E-01 | .10321E-01 | .13694E+00 | .33394E+01 |
| .57703E-03 | .92998E+00 | -.21331E-01 | .92336E-02 | .13595E+00 | .27410E+01 |
| .64351E-03 | .94675E+00 | -.23602E-01 | .92104E-02 | .13564E+00 | .23910E+01 |
| .71259E-03 | .94688E+00 | -.26732E-01 | .10312E-01 | .13658E+00 | .22843E+01 |
| .78166E-03 | .94638E+00 | -.32136E-01 | .11940E-01 | .13611E+00 | .23153E+01 |
| .85073E-03 | .94463E+00 | -.34039E-01 | .13555E-01 | .13555E+00 | .23567E+01 |
| .91980E-03 | .94324E+00 | -.37907E-01 | .15088E-01 | .13502E+00 | .23886E+01 |
| .98870E-03 | .94180E+00 | -.41056E-01 | .16551E-01 | .13408E+00 | .24185E+01 |
| .10576E-02 | .94043E+00 | -.45822E-01 | .17968E-01 | .13321E+00 | .24473E+01 |
| .11265E-02 | .93966E+00 | -.49822E-01 | .19346E-01 | .13224E+00 | .24751E+01 |
| .11954E-02 | .93767E+00 | -.53828E-01 | .20691E-01 | .13120E+00 | .25026E+01 |
| .12643E-02 | .93628E+00 | -.57901E-01 | .22011E-01 | .13004E+00 | .25296E+01 |
| .13332E-02 | .93489E+00 | -.61951E-01 | .23304E-01 | .12883E+00 | .25561E+01 |
| .14004E-02 | .93354E+00 | -.65963E-01 | .24545E-01 | .12751E+00 | .25812E+01 |
| .14607E-02 | .93234E+00 | -.69529E-01 | .25634E-01 | .12631E+00 | .26038E+01 |
| .15141E-02 | .93136E+00 | -.72734E-01 | .26979E-01 | .12513E+00 | .26214E+01 |
| .15623E-02 | .93039E+00 | -.75569E-01 | .27608E-01 | .12407E+00 | .26372E+01 |
| .16053E-02 | .92960E+00 | -.78181E-01 | .28125E-01 | .12301E+00 | .26504E+01 |
| .16450E-02 | .92890E+00 | -.80913E-01 | .28750E-01 | .12287E+00 | .26618E+01 |
| .16811E-02 | .92829E+00 | -.82699E-01 | .29305E-01 | .12110E+00 | .26712E+01 |
| .17139E-02 | .92778E+00 | -.84602E-01 | .29765E-01 | .12029E+00 | .26790E+01 |
| .17431E-02 | .92735E+00 | -.86509E-01 | .30144E-01 | .11941E+00 | .26850E+01 |
| .17697E-02 | .92703E+00 | -.87888E-01 | .30440E-01 | .11876E+00 | .26897E+01 |
| .17934E-02 | .92671E+00 | -.89415E-01 | .30692E-01 | .11793E+00 | .26929E+01 |
| .18162E-02 | .92640E+00 | -.90564E-01 | .30879E-01 | .11749E+00 | .26956E+01 |
| .18366E-02 | .92630E+00 | -.92077E-01 | .31014E-01 | .11647E+00 | .26963E+01 |

| | | | | | |
|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .13093E+00 | .55093E+01 |
| .70454E-05 | .16254E-01 | -.96149E-05 | .20460E-02 | .13091E+00 | .56181E+01 |
| .14795E-04 | .33847E-01 | -.42100E-04 | .41882E-02 | .13090E+00 | .57301E+01 |
| .23250E-04 | .52730E-01 | -.10189E-03 | .64024E-02 | .13088E+00 | .58435E+01 |
| .32585E-04 | .73246E-01 | -.19726E-03 | .87066E-02 | .13086E+00 | .59589E+01 |
| .42977E-04 | .95713E-01 | -.33698E-03 | .11107E-01 | .13084E+00 | .60759E+01 |
| .54425E-04 | .12006E+00 | -.53078E-03 | .13563E-01 | .13081E+00 | .61915E+01 |
| .66931E-04 | .14624E+00 | -.78666E-03 | .16032E-01 | .13079E+00 | .63028E+01 |
| .73800E-04 | .16045E+00 | -.94574E-03 | .17298E-01 | .13078E+00 | .63577E+01 |
| .80670E-04 | .17455E+00 | -.11175E-02 | .18503E-01 | .13077E+00 | .64082E+01 |
| .88243E-04 | .18998E+00 | -.13210E-02 | .19761E-01 | .13075E+00 | .64590E+01 |
| .95817E-04 | .20528E+00 | -.15387E-02 | .20950E-01 | .13074E+00 | .65048E+01 |
| .11255E-03 | .23872E+00 | -.20667E-02 | .23332E-01 | .13071E+00 | .65885E+01 |
| .13104E-03 | .27511E+00 | -.27201E-02 | .25599E-01 | .13069E+00 | .66543E+01 |
| .15148E-03 | .31470E+00 | -.35141E-02 | .27688E-01 | .13066E+00 | .66959E+01 |
| .17462E-03 | .35771E+00 | -.44685E-02 | .29520E-01 | .13066E+00 | .67054E+01 |
| .19886E-03 | .40429E+00 | -.55917E-02 | .31006E-01 | .13064E+00 | .66731E+01 |
| .22616E-03 | .45456E+00 | -.68956E-02 | .32051E-01 | .13065E+00 | .65883E+01 |
| .25804E-03 | .51194E+00 | -.84684E-02 | .32564E-01 | .13065E+00 | .64268E+01 |
| .29309E-03 | .57317E+00 | -.10221E-01 | .32355E-01 | .13069E+00 | .61768E+01 |
| .33184E-03 | .63816E+00 | -.12108E-01 | .31323E-01 | .13073E+00 | .58204E+01 |
| .37446E-03 | .70553E+00 | -.14060E-01 | .29420E-01 | .13081E+00 | .53462E+01 |
| .42096E-03 | .77267E+00 | -.15931E-01 | .26722E-01 | .13089E+00 | .47578E+01 |
| .47204E-03 | .83636E+00 | -.17630E-01 | .23469E-01 | .13100E+00 | .40745E+01 |
| .52823E-03 | .89685E+00 | -.19110E-01 | .20239E-01 | .13109E+00 | .33625E+01 |
| .59005E-03 | .92909E+00 | -.20665E-01 | .18015E-01 | .13112E+00 | .27470E+01 |
| .65804E-03 | .94738E+00 | -.22034E-01 | .17839E-01 | .13103E+00 | .23642E+01 |
| .72867E-03 | .95010E+00 | -.25679E-01 | .19917E-01 | .13083E+00 | .22516E+01 |
| .79930E-03 | .94773E+00 | -.29100E-01 | .23133E-01 | .13041E+00 | .22781E+01 |
| .86993E-03 | .94593E+00 | -.32889E-01 | .26367E-01 | .12991E+00 | .23188E+01 |
| .94056E-03 | .94455E+00 | -.36635E-01 | .29422E-01 | .12930E+00 | .23495E+01 |
| .10110E-02 | .94311E+00 | -.40454E-01 | .32374E-01 | .12860E+00 | .23779E+01 |
| .10815E-02 | .94174E+00 | -.44266E-01 | .35220E-01 | .12782E+00 | .24051E+01 |
| .11519E-02 | .94037E+00 | -.48146E-01 | .37983E-01 | .12695E+00 | .24314E+01 |
| .12224E-02 | .93899E+00 | -.52006E-01 | .40678E-01 | .12602E+00 | .24572E+01 |
| .12928E-02 | .93769E+00 | -.55928E-01 | .43318E-01 | .12497E+00 | .24829E+01 |
| .13633E-02 | .93621E+00 | -.59821E-01 | .45902E-01 | .12389E+00 | .25074E+01 |
| .14320E-02 | .93485E+00 | -.63675E-01 | .48376E-01 | .12278E+00 | .25309E+01 |
| .14936E-02 | .93365E+00 | -.67094E-01 | .50547E-01 | .12162E+00 | .25513E+01 |
| .15462E-02 | .93261E+00 | -.70169E-01 | .52432E-01 | .12055E+00 | .25685E+01 |
| .15975E-02 | .93166E+00 | -.72900E-01 | .54086E-01 | .11959E+00 | .25834E+01 |
| .16416E-02 | .93088E+00 | -.75384E-01 | .55918E-01 | .11863E+00 | .25958E+01 |
| .16821E-02 | .93018E+00 | -.77612E-01 | .56779E-01 | .11778E+00 | .26064E+01 |

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| .17191E-02 | .92956E+00 | -.79717E-01 | .57872E-01 | .11888E+00 | .26153E+01 |
| .17525E-02 | .92904E+00 | -.81523E-01 | .58791E-01 | .11615E+00 | .26225E+01 |
| .17825E-02 | .92881E+00 | -.83239E-01 | .59947E-01 | .11534E+00 | .26280E+01 |
| .18096E-02 | .92826E+00 | -.84667E-01 | .60153E-01 | .11476E+00 | .26325E+01 |
| .18343E-02 | .92797E+00 | -.86141E-01 | .60637E-01 | .11397E+00 | .26353E+01 |
| .18572E-02 | .92775E+00 | -.87226E-01 | .60996E-01 | .11359E+00 | .26378E+01 |
| .18783E-02 | .92757E+00 | -.88706E-01 | .61267E-01 | .11262E+00 | .26392E+01 |
| 0. | 0. | 0. | 0. | .12185E+00 | .55293E+01 |
| .73043E-05 | .16039E-01 | -.86370E-05 | .29881E-02 | .12184E+00 | .56159E+01 |
| .15339E-04 | .33405E-01 | -.37989E-04 | .61136E-02 | .12182E+00 | .57256E+01 |
| .24104E-04 | .52649E-01 | -.82055E-04 | .93473E-02 | .12180E+00 | .58365E+01 |
| .33782E-04 | .72316E-01 | -.14949E-03 | .12714E-01 | .12178E+00 | .59498E+01 |
| .44556E-04 | .94503E-01 | -.38525E-03 | .16227E-01 | .12177E+00 | .60642E+01 |
| .56426E-04 | .11856E+00 | -.63145E-03 | .19812E-01 | .12174E+00 | .61723E+01 |
| .69391E-04 | .14443E+00 | -.91457E-03 | .23423E-01 | .12173E+00 | .62862E+01 |
| .75512E-04 | .15848E+00 | -.85975E-03 | .25276E-01 | .12172E+00 | .63399E+01 |
| .82534E-04 | .17242E+00 | -.10167E-02 | .27039E-01 | .12171E+00 | .63893E+01 |
| .91486E-04 | .18767E+00 | -.12328E-02 | .28881E-01 | .12170E+00 | .64398E+01 |
| .99338E-04 | .20281E+00 | -.14021E-02 | .30621E-01 | .12169E+00 | .64838E+01 |
| .11669E-03 | .23587E+00 | -.18865E-02 | .34111E-01 | .12166E+00 | .65857E+01 |
| .13586E-03 | .27187E+00 | -.24677E-02 | .37437E-01 | .12165E+00 | .66303E+01 |
| .15704E-03 | .31105E+00 | -.32204E-02 | .40504E-01 | .12163E+00 | .66713E+01 |
| .18042E-03 | .35362E+00 | -.41044E-02 | .43199E-01 | .12163E+00 | .66811E+01 |
| .20616E-03 | .39976E+00 | -.51408E-02 | .45393E-01 | .12162E+00 | .66509E+01 |
| .23447E-03 | .44957E+00 | -.63675E-02 | .46946E-01 | .12163E+00 | .65689E+01 |
| .25752E-03 | .50649E+00 | -.78435E-02 | .47728E-01 | .12164E+00 | .64123E+01 |
| .30380E-03 | .56731E+00 | -.94997E-02 | .47456E-01 | .12169E+00 | .61703E+01 |
| .34403E-03 | .63261E+00 | -.11297E-01 | .45979E-01 | .12174E+00 | .58236E+01 |
| .38822E-03 | .69933E+00 | -.13172E-01 | .43216E-01 | .12182E+00 | .53604E+01 |
| .43643E-03 | .76679E+00 | -.14908E-01 | .39261E-01 | .12192E+00 | .47819E+01 |
| .48939E-03 | .83141E+00 | -.16649E-01 | .34428E-01 | .12203E+00 | .41036E+01 |
| .54764E-03 | .88780E+00 | -.18082E-01 | .29517E-01 | .12213E+00 | .33852E+01 |
| .61173E-03 | .92811E+00 | -.19537E-01 | .25944E-01 | .12218E+00 | .27482E+01 |
| .68222E-03 | .94044E+00 | -.21546E-01 | .25307E-01 | .12214E+00 | .23353E+01 |
| .75944E-03 | .95216E+00 | -.2[illegible]E-01 | .28385E-01 | .12208E+00 | .22907E+01 |
| .82867E-03 | .94987E+00 | -.27388E-01 | .32756E-01 | .12166E+00 | .23194E+01 |
| .90190E-03 | .94602E+00 | -.30977E-01 | .37561E-01 | .12125E+00 | .22932E+01 |
| .97512E-03 | .94666E+00 | -.34513E-01 | .42102E-01 | .12074E+00 | .22678E+01 |
| .10482E-02 | .94323E+00 | -.38185E-01 | .45499E-01 | .12010E+00 | .23163E+01 |
| .11212E-02 | .94369E+00 | -.41684E-01 | .50740E-01 | .11952E+00 | .23389E+01 |
| .11942E-02 | .94249E+00 | -.45318E-01 | .54661E-01 | .11876E+00 | .23628E+01 |
| .12673E-02 | .94111E+00 | -.48926E-01 | .58877E-01 | .11952E+00 | .23861E+01 |
| .13403E-02 | .93972E+00 | -.52584E-01 | .62814E-01 | .11714E+00 | .24090E+01 |

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| .14134E-02 | .93832E+00 | -.58296E-01 | .66666E-01 | .11629E+00 | .24315E+01 |
| .14846E-02 | .93696E+00 | -.59788E-01 | .70360E-01 | .11524E+00 | .24527E+01 |
| .15485E-02 | .93574E+00 | -.62955E-01 | .73602E-01 | .11439E+00 | .24711E+01 |
| .16051E-02 | .93468E+00 | -.65804E-01 | .76420E-01 | .11344E+00 | .24865E+01 |
| .16562E-02 | .93374E+00 | -.68325E-01 | .78897E-01 | .11264E+00 | .24999E+01 |
| .17019E-02 | .93293E+00 | -.70623E-01 | .81047E-01 | .11182E+00 | .25110E+01 |
| .17439E-02 | .93221E+00 | -.72673E-01 | .82941E-01 | .11111E+00 | .25208E+01 |
| .17822E-02 | .93158E+00 | -.74612E-01 | .84567E-01 | .11034E+00 | .25284E+01 |
| .18169E-02 | .93105E+00 | -.76279E-01 | .85970E-01 | .10973E+00 | .25349E+01 |
| .18480E-02 | .93061E+00 | -.77873E-01 | .87128E-01 | .10903E+00 | .25397E+01 |
| .18761E-02 | .93026E+00 | -.79178E-01 | .88118E-01 | .10854E+00 | .25436E+01 |
| .19017E-02 | .92997E+00 | -.80562E-01 | .88742E-01 | .10784E+00 | .25460E+01 |
| .19254E-02 | .92975E+00 | -.81938E-01 | .89272E-01 | .10755E+00 | .25481E+01 |
| .19473E-02 | .92959E+00 | -.82962E-01 | .89665E-01 | .10664E+00 | .25481E+01 |
| 0. | 0. | 0. | 0. | .11053E+00 | .55093E+01 |
| .76731E-05 | .18735E-01 | -.72949E-05 | .38574E-02 | .11052E+00 | .56129E+01 |
| .16113E-04 | .32777E-01 | -.31952E-04 | .78583E-02 | .11051E+00 | .57195E+01 |
| .25321E-04 | .51080E-01 | -.77603E-04 | .12018E-01 | .11049E+00 | .58274E+01 |
| .35488E-04 | .70978E-01 | -.15079E-03 | .16350E-01 | .11048E+00 | .59370E+01 |
| .46806E-04 | .92779E-01 | -.25853E-03 | .20867E-01 | .11047E+00 | .60481E+01 |
| .59274E-04 | .11542E+00 | -.40278E-03 | .25492E-01 | .11045E+00 | .61578E+01 |
| .72894E-04 | .14185E+00 | -.60827E-03 | .30146E-01 | .11044E+00 | .62635E+01 |
| .88375E-04 | .15566E+00 | -.73257E-03 | .32535E-01 | .11043E+00 | .63155E+01 |
| .87857E-04 | .16937E+00 | -.86789E-03 | .34810E-01 | .11042E+00 | .63634E+01 |
| .96185E-04 | .18437E+00 | -.10282E-02 | .37108E-01 | .11041E+00 | .64116E+01 |
| .11435E-03 | .19926E+00 | -.12014E-02 | .39435E-01 | .11040E+00 | .64551E+01 |
| .12258E-03 | .23179E+00 | -.16200E-02 | .43945E-01 | .11039E+00 | .65347E+01 |
| .14272E-03 | .26722E+00 | -.21434E-02 | .48249E-01 | .11038E+00 | .65977E+01 |
| .16497E-03 | .30580E+00 | -.27847E-02 | .52224E-01 | .11037E+00 | .66381E+01 |
| .18952E-03 | .34773E+00 | -.35629E-02 | .55728E-01 | .11037E+00 | .66486E+01 |
| .21657E-03 | .39321E+00 | -.44884E-02 | .58793E-01 | .11037E+00 | .66208E+01 |
| .24631E-03 | .44235E+00 | -.55766E-02 | .60646E-01 | .11039E+00 | .65435E+01 |
| .28103E-03 | .49856E+00 | -.69869E-02 | .61704E-01 | .11041E+00 | .63953E+01 |
| .31920E-03 | .55875E+00 | -.84131E-02 | .61419E-01 | .11047E+00 | .61639E+01 |
| .36140E-03 | .62297E+00 | -.10068E-01 | .59572E-01 | .11052E+00 | .58314E+01 |
| .40782E-03 | .69011E+00 | -.11820E-01 | .56055E-01 | .11061E+00 | .53045E+01 |
| .45847E-03 | .75790E+00 | -.13942E-01 | .50851E-01 | .11071E+00 | .46213E+01 |
| .51410E-03 | .82369E+00 | -.15137E-01 | .44604E-01 | .11084E+00 | .41522E+01 |
| .57529E-03 | .88218E+00 | -.16505E-01 | .37955E-01 | .11095E+00 | .34280E+01 |
| .64262E-03 | .92598E+00 | -.17823E-01 | .32774E-01 | .11103E+00 | .27627E+01 |
| .71667E-03 | .94946E+00 | -.19607E-01 | .31223E-01 | .11102E+00 | .23062E+01 |
| .79359E-03 | .95483E+00 | -.21924E-01 | .34260E-01 | .11095E+00 | .21371E+01 |
| .87051E-03 | .95276E+00 | -.24860E-01 | .40146E-01 | .11072E+00 | .21441E+01 |
| .94743E-03 | .95080E+00 | -.28162E-01 | .46453E-01 | .11040E+00 | .21820E+01 |

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| .10244E-02 | .94949E+00 | -.31406E-01 | .52418E-01 | .11002E+00 | .22082E+01 |
| .11011E-02 | .94807E+00 | -.34679E-01 | .58212E-01 | .10957E+00 | .22315E+01 |
| .11778E-02 | .94670E+00 | -.37954E-01 | .63839E-01 | .10979E+00 | .22536E+01 |
| .12545E-02 | .94535E+00 | -.41224E-01 | .69248E-01 | .10852E+00 | .22745E+01 |
| .13313E-02 | .94397E+00 | -.44483E-01 | .74553E-01 | .10795E+00 | .22948E+01 |
| .14080E-02 | .94258E+00 | -.47774E-01 | .79759E-01 | .10726E+00 | .23140E+01 |
| .14847E-02 | .94118E+00 | -.51022E-01 | .84857E-01 | .10660E+00 | .23340E+01 |
| .15596E-02 | .93980E+00 | -.54230E-01 | .89752E-01 | .10501E+00 | .23522E+01 |
| .16267E-02 | .93897E+00 | -.57051E-01 | .94039E-01 | .10534E+00 | .23680E+01 |
| .16662E-02 | .93748E+00 | -.59593E-01 | .97804E-01 | .11443E+00 | .23812E+01 |
| .17399E-02 | .93652E+00 | -.61825E-01 | .10110E+00 | .10383E+00 | .23927E+01 |
| .17878E-02 | .93568E+00 | -.63872E-01 | .10398E+00 | .10318E+00 | .24021E+01 |
| .18319E-02 | .93494E+00 | -.65608E-01 | .10651E+00 | .10264E+00 | .24103E+01 |
| .18722E-02 | .93429E+00 | -.67409E-01 | .10872E+00 | .10222E+00 | .24169E+01 |
| .19087E-02 | .93374E+00 | -.68873E-01 | .11058E+00 | .10195E+00 | .24224E+01 |
| .19413E-02 | .93329E+00 | -.70305E-01 | .11211E+00 | .10197E+00 | .24264E+01 |
| .19708E-02 | .93292E+00 | -.71445E-01 | .11332E+00 | .10061E+00 | .24297E+01 |
| .19977E-02 | .93264E+00 | -.72710E-01 | .11429E+00 | .10001E+00 | .24314E+01 |
| .20226E-02 | .93241E+00 | -.73541E-01 | .11498E+00 | .99854E-01 | .24332E+01 |
| .20456E-02 | .93227E+00 | -.74895E-01 | .11548E+00 | .98998E-01 | .24327E+01 |
| 0. | 0. | 0. | 0. | .93121E-01 | .55093E+01 |
| .01501E-05 | .15352E-01 | -.54128E-05 | .65555E-02 | .98114E-01 | .56092E+01 |
| .17116E-04 | .31986E-01 | -.23987E-04 | .93316E-02 | .98104E-01 | .57115E+01 |
| .26698E-04 | .49859E-01 | -.50821E-04 | .14275E-01 | .98096E-01 | .58158E+01 |
| .37695E-04 | .69297E-01 | -.11422E-03 | .19423E-01 | .98084E-01 | .59213E+01 |
| .49717E-04 | .90604E-01 | -.19671E-03 | .24804E-01 | .98076E-01 | .60283E+01 |
| .62961E-04 | .11372E+00 | -.31249E-03 | .30313E-01 | .98062E-01 | .61339E+01 |
| .77428E-04 | .13859E+00 | -.46725E-03 | .35862E-01 | .98055E-01 | .62356E+01 |
| .85374E-04 | .15210E+00 | -.56445E-03 | .38712E-01 | .98049E-01 | .62857E+01 |
| .93321E-04 | .16551E+00 | -.67012E-03 | .41427E-01 | .98045E-01 | .63318E+01 |
| .10208E-03 | .18028E+00 | -.79615E-03 | .44268E-01 | .98039E-01 | .63783E+01 |
| .11086E-03 | .19477E+00 | -.93193E-03 | .46952E-01 | .98036E-01 | .64202E+01 |
| .13028E-03 | .22662E+00 | -.12049E-02 | .52349E-01 | .98029E-01 | .64971E+01 |
| .15160E-03 | .26132E+00 | -.16836E-02 | .57508E-01 | .98026E-01 | .65583E+01 |
| .17523E-03 | .29912E+00 | -.22015E-02 | .62286E-01 | .98021E-01 | .65981E+01 |
| .20131E-03 | .34001E+00 | -.28353E-02 | .66913E-01 | .98033E-01 | .66098E+01 |
| .23004E-03 | .35485E+00 | -.35995E-02 | .69394E-01 | .98041E-01 | .65849E+01 |
| .26162E-03 | .43311E+00 | -.45076E-02 | .72512E-01 | .98069E-01 | .65139E+01 |
| .29850E-03 | .46839E+00 | -.56319E-02 | .72888E-01 | .98099E-01 | .63796E+01 |
| .33905E-03 | .54772E+00 | -.69262E-02 | .73647E-01 | .98155E-01 | .61581E+01 |
| .38388E-03 | .61124E+00 | -.83725E-02 | .71567E-01 | .98219E-01 | .58437E+01 |
| .43319E-03 | .67801E+00 | -.99326E-02 | .67472E-01 | .98310E-01 | .54188E+01 |
| .48698E-03 | .74606E+00 | -.11499E-01 | .61421E-01 | .98413E-01 | .48760E+01 |

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| .54507E-03 | .51309E+00 | -.12977E-01 | .53740E-01 | .98535E-01 | .42210E+01 |
| .61107E-03 | .87429E+00 | -.14240E-01 | .45408E-01 | .98658E-01 | .34943E+01 |
| .68259E-03 | .92224E+00 | -.15378E-01 | .38410E-01 | .98753E-01 | .27970E+01 |
| .76124E-03 | .95002E+00 | -.16863E-01 | .35470E-01 | .98788E-01 | .22852E+01 |
| .84296E-03 | .95733E+00 | -.16932E-01 | .38177E-01 | .98776E-01 | .20683E+01 |
| .92465E-03 | .95628E+00 | -.21389E-01 | .44899E-01 | .98645E-01 | .20562E+01 |
| .10064E-02 | .95418E+00 | -.24314E-01 | .52587E-01 | .98418E-01 | .20921E+01 |
| .10881E-02 | .95251E+00 | -.27202E-01 | .59893E-01 | .98174E-01 | .21160E+01 |
| .11696E-02 | .95153E+00 | -.30062E-01 | .67016E-01 | .97844E-01 | .21359E+01 |
| .12511E-02 | .95017E+00 | -.32910E-01 | .73918E-01 | .97526E-01 | .21549E+01 |
| .13326E-02 | .94883E+00 | -.35762E-01 | .80627E-01 | .97115E-01 | .21725E+01 |
| .14141E-02 | .94746E+00 | -.38591E-01 | .87174E-01 | .96734E-01 | .21894E+01 |
| .14956E-02 | .94600E+00 | -.41412E-01 | .93607E-01 | .96246E-01 | .22058E+01 |
| .15771E-02 | .94466E+00 | -.44191E-01 | .99913E-01 | .95802E-01 | .22217E+01 |
| .16565E-02 | .94327E+00 | -.48939E-01 | .10598E+00 | .95243E-01 | .22385E+01 |
| .17279E-02 | .94201E+00 | -.49318E-01 | .11131E+00 | .94793E-01 | .22496E+01 |
| .17910E-02 | .94090E+00 | -.51477E-01 | .11598E+00 | .94282E-01 | .22603E+01 |
| .18481E-02 | .93991E+00 | -.53352E-01 | .12009E+00 | .93876E-01 | .22696E+01 |
| .18990E-02 | .93903E+00 | -.55085E-01 | .12368E+00 | .93403E-01 | .22773E+01 |
| .19459E-02 | .93825E+00 | -.56993E-01 | .12685E+00 | .93039E-01 | .22839E+01 |
| .19887E-02 | .93757E+00 | -.58064E-01 | .12963E+00 | .92575E-01 | .22892E+01 |
| .20274E-02 | .93700E+00 | -.59278E-01 | .13197E+00 | .92264E-01 | .22936E+01 |
| .20620E-02 | .93652E+00 | -.60512E-01 | .13390E+00 | .91811E-01 | .22967E+01 |
| .20934E-02 | .93614E+00 | -.61458E-01 | .13543E+00 | .91588E-01 | .22993E+01 |
| .21219E-02 | .93584E+00 | -.62575E-01 | .13663E+00 | .91058E-01 | .23004E+01 |
| .21484E-02 | .93562E+00 | -.63230E-01 | .13748E+00 | .91038E-01 | .23018E+01 |
| .21729E-02 | .93549E+00 | -.64506E-01 | .13808E+00 | .90289E-01 | .23009E+01 |
| 0. | 0. | 0. | 0. | .85637E-01 | .55093E+01 |
| .87369E-05 | .14919E-01 | -.31928E-05 | .51160E-02 | .85633E-01 | .56049E+01 |
| .18347E-04 | .31092E-01 | -.14340E-04 | .10464E-01 | .85628E-01 | .57031E+01 |
| .28832E-04 | .48473E-01 | -.35385E-04 | .16044E-01 | .85623E-01 | .58026E+01 |
| .40408E-04 | .67396E-01 | -.69812E-04 | .21844E-01 | .85616E-01 | .59036E+01 |
| .53295E-04 | .88143E-01 | -.12157E-03 | .27901E-01 | .85611E-01 | .60059E+01 |
| .67492E-04 | .11065E+00 | -.19531E-03 | .34114E-01 | .85604E-01 | .61069E+01 |
| .83000E-04 | .13489E+00 | -.29542E-03 | .40377E-01 | .85601E-01 | .62042E+01 |
| .91519E-04 | .14808E+00 | -.35909E-03 | .43598E-01 | .85598E-01 | .62522E+01 |
| .10004E-03 | .16114E+00 | -.42365E-03 | .46667E-01 | .85596E-01 | .62964E+01 |
| .10943E-03 | .17546E+00 | -.51272E-03 | .49881E-01 | .85594E-01 | .63409E+01 |
| .11882E-03 | .18987E+00 | -.60388E-03 | .92921E-01 | .85594E-01 | .63811E+01 |
| .13957E-03 | .22074E+00 | -.83010E-03 | .59039E-01 | .85590E-01 | .64550E+01 |
| .16251E-03 | .25460E+00 | -.11197E-02 | .64502E-01 | .85596E-01 | .65142E+01 |
| .16784E-03 | .29150E+00 | -.14844E-02 | .70350E-01 | .85600E-01 | .65534E+01 |
| .21500E-03 | .33166E+00 | -.19401E-02 | .75192E-01 | .85617E-01 | .65662E+01 |

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| .24660E-03 | .37527E+00 | -.24991E-02 | .79209E-01 | .85633E-01 | .65449E+01 |
| .28045E-03 | .42249E+00 | -.31782E-02 | .82161E-01 | .85665E-01 | .64805E+01 |
| .31999E-03 | .47088E+00 | -.40381E-02 | .83542E-01 | .85703E-01 | .63531E+01 |
| .36345E-03 | .53492E+00 | -.50524E-02 | .83737E-01 | .85750E-01 | .61512E+01 |
| .41151E-03 | .59754E+00 | -.62150E-02 | .81556E-01 | .85827E-01 | .58574E+01 |
| .46436E-03 | .66373E+00 | -.75032E-02 | .77087E-01 | .85913E-01 | .54563E+01 |
| .52203E-03 | .73182E+00 | -.88321E-02 | .70343E-01 | .85812E-01 | .49408E+01 |
| .58537E-03 | .79997E+00 | -.10116E-01 | .61590E-01 | .86124E-01 | .43058E+01 |
| .65508E-03 | .86393E+00 | -.11211E-01 | .51759E-01 | .86248E-01 | .35817E+01 |
| .73171E-03 | .91654E+00 | -.12120E-01 | .42889E-01 | .86345E-01 | .28546E+01 |
| .81602E-03 | .94963E+00 | -.13232E-01 | .38118E-01 | .86408E-01 | .22031E+01 |
| .90951E-03 | .96099E+00 | -.14520E-01 | .39896E-01 | .86430E-01 | .20024E+01 |
| .99122E-03 | .96026E+00 | -.16928E-01 | .46873E-01 | .86395E-01 | .19621E+01 |
| .10788E-02 | .95800E+00 | -.19394E-01 | .55718E-01 | .86236E-01 | .19947E+01 |
| .11664E-02 | .95678E+00 | -.21808E-01 | .64238E-01 | .86109E-01 | .20187E+01 |
| .12537E-02 | .95547E+00 | -.24253E-01 | .72568E-01 | .85876E-01 | .20330E+01 |
| .13411E-02 | .95412E+00 | -.26623E-01 | .80689E-01 | .85693E-01 | .20488E+01 |
| .14285E-02 | .95281E+00 | -.28954E-01 | .88048E-01 | .85417E-01 | .20629E+01 |
| .15158E-02 | .95146E+00 | -.31267E-01 | .96298E-01 | .85185E-01 | .20763E+01 |
| .16032E-02 | .95008E+00 | -.33559E-01 | .10389E+00 | .84876E-01 | .20891E+01 |
| .16906E-02 | .94867E+00 | -.35790E-01 | .11133E+00 | .84612E-01 | .21015E+01 |
| .17758E-02 | .94726E+00 | -.37982E-01 | .11891E+00 | .84261E-01 | .21130E+01 |
| .18522E-02 | .94590E+00 | -.39867E-01 | .12484E+00 | .84006E-01 | .21229E+01 |
| .19199E-02 | .94464E+00 | -.41580E-01 | .13337E+00 | .83678E-01 | .21311E+01 |
| .19811E-02 | .94381E+00 | -.43038E-01 | .13527E+00 | .83448E-01 | .21382E+01 |
| .20357E-02 | .94292E+00 | -.44410E-01 | .13957E+00 | .83138E-01 | .21439E+01 |
| .20859E-02 | .94208E+00 | -.45569E-01 | .14337E+00 | .82935E-01 | .21489E+01 |
| .21318E-02 | .94136E+00 | -.46741E-01 | .14672E+00 | .82619E-01 | .21527E+01 |
| .21733E-02 | .94074E+00 | -.47666E-01 | .14954E+00 | .82454E-01 | .21561E+01 |
| .22164E-02 | .94023E+00 | -.48673E-01 | .15187E+00 | .82128E-01 | .21582E+01 |
| .22441E-02 | .93982E+00 | -.49378E-01 | .15372E+00 | .82934E-01 | .21601E+01 |
| .22746E-02 | .93952E+00 | -.50344E-01 | .15517E+00 | .81632E-01 | .21607E+01 |
| .23030E-02 | .93928E+00 | -.50790E-01 | .15616E+00 | .81703E-01 | .21613E+01 |
| .23293E-02 | .93917E+00 | -.51994E-01 | .15665E+00 | .81831E-01 | .21605E+01 |
| 0. | 0. | 0. | 0. | .73900E-01 | .55893E+01 |
| .94253E-05 | .14496E-01 | -.67854E-06 | .94922E-02 | .73899E-01 | .56843E+01 |
| .19793E-04 | .30137E-01 | -.33595E-05 | .11260E-01 | .73897E-01 | .56936E+01 |
| .31104E-04 | .47002E-01 | -.90235E-05 | .17239E-01 | .73896E-01 | .57035E+01 |
| .43592E-04 | .65360E-01 | -.19136E-04 | .23482E-01 | .73894E-01 | .58047E+01 |
| .57495E-04 | .85503E-01 | -.35711E-04 | .30008E-01 | .73893E-01 | .59628E+01 |
| .72811E-04 | .10738E+00 | -.61235E-04 | .36710E-01 | .73891E-01 | .60782E+01 |
| .89541E-04 | .13092E+00 | -.96515E-04 | .43474E-01 | .73892E-01 | .61703E+01 |
| .98738E-04 | .14373E+00 | -.12356E-03 | .46956E-01 | .73892E-01 | .62166E+01 |

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| .10792E-03 | .15644E+00 | -.15192E-03 | .50276E-01 | .73892E-01 | .62588E+01 |
| .11805E-03 | .17036E+00 | -.18715E-03 | .53756E-01 | .73893E-01 | .63013E+01 |
| .12818E-03 | .18418E+00 | -.22664E-03 | .57051E-01 | .73895E-01 | .63397E+01 |
| .15057E-03 | .21440E+00 | -.32916E-03 | .63693E-01 | .73899E-01 | .64105E+01 |
| .17531E-03 | .24735E+00 | -.46826E-03 | .70074E-01 | .73909E-01 | .64675E+01 |
| .20264E-03 | .28327E+00 | -.65391E-03 | .76026E-01 | .73921E-01 | .65061E+01 |
| .23281E-03 | .32230E+00 | -.89874E-03 | .81344E-01 | .73940E-01 | .65201E+01 |
| .26603E-03 | .36487E+00 | -.12154E-02 | .85796E-01 | .73963E-01 | .65026E+01 |
| .30255E-03 | .41092E+00 | -.16499E-02 | .89122E-01 | .73996E-01 | .64449E+01 |
| .34520E-03 | .46382E+00 | -.21580E-02 | .91112E-01 | .74038E-01 | .53289E+01 |
| .39209E-03 | .52085E+00 | -.28244E-02 | .91200E-01 | .74092E-01 | .61434E+01 |
| .44393E-03 | .58235E+00 | -.36240E-02 | .89066E-01 | .74157E-01 | .58715E+01 |
| .50096E-03 | .64773E+00 | -.45491E-02 | .84454E-01 | .74234E-01 | .54972E+01 |
| .56316E-03 | .71560E+00 | -.55400E-02 | .77325E-01 | .74322E-01 | .50102E+01 |
| .63150E-03 | .78458E+00 | -.65258E-02 | .67862E-01 | .74415E-01 | .44019E+01 |
| .70667E-03 | .85109E+00 | -.73572E-02 | .58883E-01 | .74525E-01 | .36883E+01 |
| .78937E-03 | .90850E+00 | -.79675E-02 | .46274E-01 | .74612E-01 | .29378E+01 |
| .88033E-03 | .94777E+00 | -.86197E-02 | .39435E-01 | .74686E-01 | .22980E+01 |
| .97482E-03 | .98363E+00 | -.98531E-02 | .39812E-01 | .74710E-01 | .19479E+01 |
| .10693E-02 | .96446E+00 | -.11404E-01 | .46264E-01 | .74744E-01 | .18681E+01 |
| .11638E-02 | .96208E+00 | -.13360E-01 | .55038E-01 | .74629E-01 | .18945E+01 |
| .12583E-02 | .96090E+00 | -.15414E-01 | .69454E-01 | .74570E-01 | .19153E+01 |
| .13525E-02 | .95971E+00 | -.17274E-01 | .74814E-01 | .74412E-01 | .19278E+01 |
| .14468E-02 | .95840E+00 | -.19123E-01 | .84324E-01 | .74314E-01 | .19403E+01 |
| .15410E-02 | .95714E+00 | -.20912E-01 | .92983E-01 | .74133E-01 | .19511E+01 |
| .16353E-02 | .95583E+00 | -.22651E-01 | .10175E+00 | .74095E-01 | .19609E+01 |
| .17296E-02 | .95448E+00 | -.24360E-01 | .11039E+00 | .73924E-01 | .19702E+01 |
| .18238E-02 | .95308E+00 | -.25990E-01 | .11888E+00 | .73791E-01 | .19790E+01 |
| .19157E-02 | .95167E+00 | -.27590E-01 | .12707E+00 | .73692E-01 | .19870E+01 |
| .19982E-02 | .95037E+00 | -.28922E-01 | .13431E+00 | .73580E-01 | .19939E+01 |
| .20712E-02 | .94921E+00 | -.30131E-01 | .14066E+00 | .73394E-01 | .19995E+01 |
| .21372E-02 | .94814E+00 | -.31155E-01 | .14630E+00 | .73101E-01 | .20043E+01 |
| .21961E-02 | .94719E+00 | -.32132E-01 | .15126E+00 | .72922E-01 | .20080E+01 |
| .22503E-02 | .94633E+00 | -.32912E-01 | .15567E+00 | .72699E-01 | .20114E+01 |
| .22998E-02 | .94557E+00 | -.33759E-01 | .15956E+00 | .72455E-01 | .20138E+01 |
| .23446E-02 | .94490E+00 | -.34369E-01 | .16286E+00 | .72213E-01 | .20160E+01 |
| .23846E-02 | .94436E+00 | -.35131E-01 | .16568E+00 | .72090E-01 | .20172E+01 |
| .24209E-02 | .94392E+00 | -.35502E-01 | .16775E+00 | .72008E-01 | .20186E+01 |
| .24539E-02 | .94359E+00 | -.36383E-01 | .16945E+00 | .72097E-01 | .20186E+01 |
| .24845E-02 | .94334E+00 | -.36618E-01 | .17058E+00 | .72274E-01 | .20195E+01 |
| .25128E-02 | .94324E+00 | -.37746E-01 | .17133E+00 | .71873E-01 | .20179E+01 |
| 0. | 0. | 0. | 0. | .63409E-01 | .55993E+01 |
| .10204E-04 | .13996E-01 | .19863E-05 | .35721E-02 | .63441E-01 | .55936E+01 |
| .21429E-04 | .29188E-01 | .82733E-05 | .11634E-01 | .63462E-01 | .56844E+01 |

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| .33674E-04 | .45531E-01 | .18933E-04 | .17821E-01 | .63445E-01 | .57742E+01 |
| .47195E-04 | .63332E-01 | .34703E-04 | .24286E-01 | .63447E-01 | .58655E+01 |
| .62246E-04 | .82872E-01 | .55831E-04 | .31053E-01 | .63463E-01 | .59580E+01 |
| .78828E-04 | .10410E+00 | .81626E-04 | .38010E-01 | .63452E-01 | .60694E+01 |
| .96941E-04 | .12696E+00 | .11164E-03 | .45041E-01 | .63455E-01 | .61375E+01 |
| .10689E-03 | .13939E+00 | .12833E-03 | .48684E-01 | .63458E-01 | .61810E+01 |
| .11684E-03 | .15174E+00 | .14417E-03 | .52122E-01 | .63461E-01 | .62231E+01 |
| .12781E-03 | .16525E+00 | .16129E-03 | .55749E-01 | .63464E-01 | .62616E+01 |
| .13878E-03 | .17868E+00 | .17749E-03 | .59187E-01 | .63468E-01 | .62983E+01 |
| .16301E-03 | .20804E+00 | .20864E-03 | .66129E-01 | .63478E-01 | .63660E+01 |
| .18900E-03 | .24007E+00 | .23290E-03 | .72818E-01 | .63490E-01 | .64210E+01 |
| .21939E-03 | .27499E+00 | .24268E-03 | .79080E-01 | .63507E-01 | .64588E+01 |
| .25205E-03 | .31301E+00 | .22955E-03 | .84707E-01 | .63528E-01 | .64739E+01 |
| .28802E-03 | .35436E+00 | .18125E-03 | .89459E-01 | .63555E-01 | .64597E+01 |
| .32756E-03 | .39929E+00 | .84352E-04 | .93070E-01 | .63586E-01 | .64085E+01 |
| .37373E-03 | .45075E+00 | -.88460E-04 | .95334E-01 | .63628E-01 | .63034E+01 |
| .42450E-03 | .50645E+00 | -.35150E-03 | .95650E-01 | .63676E-01 | .61337E+01 |
| .48062E-03 | .56669E+00 | -.71851E-03 | .93601E-01 | .63734E-01 | .58831E+01 |
| .54236E-03 | .63106E+00 | -.11936E-02 | .89139E-01 | .63795E-01 | .55357E+01 |
| .63971E-03 | .69844E+00 | -.17421E-02 | .81936E-01 | .63869E-01 | .50792E+01 |
| .68369E-03 | .76786E+00 | -.23093E-02 | .72164E-01 | .63938E-01 | .45004E+01 |
| .76507E-03 | .83644E+00 | -.27522E-02 | .60463E-01 | .64025E-01 | .38046E+01 |
| .85461E-03 | .89834E+00 | -.29614E-02 | .48543E-01 | .64085E-01 | .30408E+01 |
| .95308E-03 | .94416E+00 | -.30598E-02 | .39702E-01 | .64151E-01 | .23407E+01 |
| .10554E-02 | .96549E+00 | -.37307E-02 | .37937E-01 | .64152E-01 | .19100E+01 |
| .11577E-02 | .96859E+00 | -.48362E-02 | .43581E-01 | .64207E-01 | .17803E+01 |
| .12600E-02 | .96625E+00 | -.62050E-02 | .53463E-01 | .64114E-01 | .17957E+01 |
| .13623E-02 | .96507E+00 | -.79122E-02 | .63820E-01 | .64076E-01 | .18160E+01 |
| .14643E-02 | .96406E+00 | -.92781E-02 | .73959E-01 | .63956E-01 | .18246E+01 |
| .15664E-02 | .96282E+00 | -.10598E-01 | .84052E-01 | .63888E-01 | .18337E+01 |
| .16684E-02 | .96165E+00 | -.11832E-01 | .93905E-01 | .63761E-01 | .18412E+01 |
| .17704E-02 | .96041E+00 | -.12988E-01 | .10356E+00 | .63690E-01 | .18476E+01 |
| .18725E-02 | .95911E+00 | -.14110E-01 | .11308E+00 | .63560E-01 | .18534E+01 |
| .19745E-02 | .95775E+00 | -.15115E-01 | .12246E+00 | .63510E-01 | .18587E+01 |
| .20740E-02 | .95637E+00 | -.16109E-01 | .13152E+00 | .63392E-01 | .18634E+01 |
| .21633E-02 | .95508E+00 | -.16857E-01 | .13955E+00 | .63364E-01 | .18673E+01 |
| .22424E-02 | .95390E+00 | -.17594E-01 | .14662E+00 | .63270E-01 | .18724E+01 |
| .23138E-02 | .95282E+00 | -.18125E-01 | .15298E+00 | .63264E-01 | .18730E+01 |
| .23776E-02 | .95185E+00 | -.18692E-01 | .15844E+00 | .63177E-01 | .18740E+01 |
| .24363E-02 | .95095E+00 | -.19077E-01 | .16340E+00 | .63193E-01 | .18766E+01 |
| .24898E-02 | .95015E+00 | -.19586E-01 | .16779E+00 | .63088E-01 | .18776E+01 |
| .25383E-02 | .94944E+00 | -.19868E-01 | .17152E+00 | .63134E-01 | .18788E+01 |
| .25817E-02 | .94887E+00 | -.20377E-01 | .17455E+00 | .62993E-01 | .18791E+01 |

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|---|---|---|---|---|---|
| .26210E-02 | .94239E+00 | -.20963E-01 | .17709E+00 | .63094E-01 | .18799E+01 |
| .26567E-02 | .94804E+00 | -.21199E-01 | .17902E+00 | .62854E-01 | .18796E+01 |
| .26898E-02 | .94777E+00 | -.21195E-01 | .18027E+00 | .63120E-01 | .18803E+01 |
| .27203E-02 | .94767E+00 | -.22286E-01 | .18107E+00 | .62588E-01 | .18785E+01 |
| 0. | 0. | 0. | 0. | .54495E-01 | .59093E+01 |
| .11055E-04 | .13569E-01 | .45648E-05 | .56575E-02 | .54499E-01 | .55911E+01 |
| .23216E-04 | .28301E-01 | .13797E-04 | .11809E-01 | .54504E-01 | .56793E+01 |
| .36483E-04 | .44162E-01 | .46655E-04 | .17792E-01 | .54508E-01 | .57605E+01 |
| .51131E-04 | .61443E-01 | .88199E-04 | .24259E-01 | .54514E-01 | .58472E+01 |
| .67437E-04 | .80419E-01 | .14652E-03 | .31036E-01 | .54518E-01 | .59350E+01 |
| .85402E-04 | .10104E+00 | .22402E-03 | .38010E-01 | .54527E-01 | .60219E+01 |
| .10503E-03 | .12326E+00 | .32147E-03 | .45068E-01 | .54531E-01 | .61057E+01 |
| .11580E-03 | .13934E+00 | .37948E-03 | .48709E-01 | .54537E-01 | .61471E+01 |
| .12658E-03 | .14734E+00 | .44039E-03 | .52188E-01 | .54540E-01 | .61853E+01 |
| .13847E-03 | .16048E+00 | .51023E-03 | .55839E-01 | .54546E-01 | .62239E+01 |
| .15039E-03 | .17354E+00 | .58287E-03 | .59303E-01 | .54551E-01 | .62589E+01 |
| .17661E-03 | .20209E+00 | .74907E-03 | .66311E-01 | .54556E-01 | .63238E+01 |
| .20563E-03 | .23324E+00 | .93948E-03 | .73082E-01 | .54579E-01 | .63767E+01 |
| .23769E-03 | .26720E+00 | .11490E-02 | .79444E-01 | .54600E-01 | .64138E+01 |
| .27307E-03 | .30428E+00 | .13744E-02 | .85192E-01 | .54619E-01 | .64295E+01 |
| .31204E-03 | .34443E+00 | .16046E-02 | .90087E-01 | .54647E-01 | .64162E+01 |
| .35488E-03 | .38808E+00 | .18304E-02 | .93863E-01 | .54675E-01 | .63725E+01 |
| .40493E-03 | .43832E+00 | .20462E-02 | .96327E-01 | .54714E-01 | .62769E+01 |
| .45990E-03 | .49268E+00 | .22207E-02 | .96867E-01 | .54752E-01 | .61212E+01 |
| .52070E-03 | .55163E+00 | .23346E-02 | .95138E-01 | .54801E-01 | .58900E+01 |
| .58759E-03 | .61488E+00 | .23778E-02 | .90834E-01 | .54844E-01 | .55674E+01 |
| .66055E-03 | .68153E+00 | .23625E-02 | .83830E-01 | .54899E-01 | .51408E+01 |
| .74071E-03 | .75102E+00 | .23349E-02 | .74140E-01 | .54940E-01 | .45915E+01 |
| .82887E-03 | .82108E+00 | .24156E-02 | .62244E-01 | .54997E-01 | .39184E+01 |
| .92588E-03 | .88674E+00 | .27394E-02 | .49561E-01 | .55024E-01 | .31522E+01 |
| .10326E-02 | .93887E+00 | .32977E-02 | .39117E-01 | .55081E-01 | .24029E+01 |
| .11434E-02 | .96623E+00 | .33239E-02 | .35357E-01 | .55024E-01 | .18932E+01 |
| .12542E-02 | .97236E+00 | .26711E-02 | .39532E-01 | .55049E-01 | .17036E+01 |
| .13651E-02 | .97032E+00 | .16727E-02 | .49108E-01 | .54956E-01 | .17018E+01 |
| .14759E-02 | .96909E+00 | .44094E-03 | .59670E-01 | .54990E-01 | .17217E+01 |
| .15864E-02 | .96833E+00 | -.50176E-03 | .70475E-01 | .54773E-01 | .17267E+01 |
| .16970E-02 | .96722E+00 | -.13069E-02 | .81191E-01 | .54885E-01 | .17322E+01 |
| .18075E-02 | .96616E+00 | -.20437E-02 | .91675E-01 | .54568E-01 | .17365E+01 |
| .19181E-02 | .96503E+00 | -.26374E-02 | .10198E+00 | .54488E-01 | .17394E+01 |
| .20286E-02 | .96382E+00 | -.32039E-02 | .11216E+00 | .54383E-01 | .17419E+01 |
| .21392E-02 | .96254E+00 | -.36025E-02 | .12222E+00 | .54335E-01 | .17440E+01 |
| .22470E-02 | .96122E+00 | -.40065E-02 | .13194E+00 | .54251E-01 | .17455E+01 |
| .23437E-02 | .95997E+00 | -.42039E-02 | .14097E+00 | .54248E-01 | .17467E+01 |
| .24294E-02 | .95882E+00 | -.44349E-02 | .14818E+00 | .54196E-01 | .17473E+01 |

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| .25068E-02 | .95775E+00 | -.44998E-02 | .15497E+00 | .54228E-01 | .17479E+01 |
| .25759E-02 | .95677E+00 | -.46588E-02 | .16097E+00 | .54189E-01 | .17480E+01 |
| .26395E-02 | .95586E+00 | -.46532E-02 | .16637E+00 | .54250E-01 | .17482E+01 |
| .26975E-02 | .95564E+00 | -.48245E-02 | .17117E+00 | .54200E-01 | .17480E+01 |
| .27500E-02 | .95431E+00 | -.47823E-02 | .17527E+00 | .54296E-01 | .17481E+01 |
| .27970E-02 | .95371E+00 | -.50485E-02 | .17870E+00 | .54210E-01 | .17476E+01 |
| .28396E-02 | .95328E+00 | -.49617E-02 | .18141E+00 | .54366E-01 | .17479E+01 |
| .28782E-02 | .95284E+00 | -.54443E-02 | .18354E+00 | .54175E-01 | .17470E+01 |
| .29142E-02 | .95254E+00 | -.51909E-02 | .18488E+00 | .54509E-01 | .17480E+01 |
| .29473E-02 | .95247E+00 | -.62921E-02 | .18572E+00 | .53979E-01 | .17459E+01 |
| 0. | 0. | 0. | 0. | .47092E-01 | .55093E+01 |
| .11954E-04 | .13201E-01 | .69531E-05 | .54612E-02 | .47098E-01 | .59870E+01 |
| .25103E-04 | .27542E-01 | .30490E-04 | .11211E-01 | .47105E-01 | .56670E+01 |
| .39448E-04 | .42986E-01 | .72399E-04 | .17190E-01 | .47111E-01 | .57481E+01 |
| .55286E-04 | .59819E-01 | .13798E-03 | .23449E-01 | .47121E-01 | .58305E+01 |
| .72918E-04 | .78310E-01 | .23122E-03 | .30014E-01 | .47126E-01 | .59142E+01 |
| .92343E-04 | .98409E-01 | .35695E-03 | .36778E-01 | .47139E-01 | .59970E+01 |
| .11356E-03 | .12807E+00 | .51772E-03 | .43632E-01 | .47144E-01 | .60769E+01 |
| .12522E-03 | .13165E+00 | .61488E-03 | .47172E-01 | .47151E-01 | .61164E+01 |
| .13687E-03 | .14355E+00 | .71798E-03 | .50555E-01 | .47155E-01 | .61530E+01 |
| .14972E-03 | .15637E+00 | .83758E-03 | .54110E-01 | .47163E-01 | .61899E+01 |
| .16257E-03 | .16910E+00 | .96318E-03 | .57485E-01 | .47168E-01 | .62233E+01 |
| .17096E-03 | .19695E+00 | .12578E-02 | .64323E-01 | .47186E-01 | .62855E+01 |
| .22234E-03 | .22732E+00 | .16065E-02 | .70946E-01 | .47198E-01 | .63285E+01 |
| .25701E-03 | .26045E+00 | .20072E-02 | .77191E-01 | .47241E-01 | .63725E+01 |
| .29526E-03 | .29653E+00 | .24628E-02 | .82858E-01 | .47238E-01 | .63887E+01 |
| .33740E-03 | .33577E+00 | .29636E-02 | .87719E-01 | .47268E-01 | .63794E+01 |
| .38372E-03 | .37835E+00 | .35066E-02 | .91517E-01 | .47287E-01 | .63380E+01 |
| .43781E-03 | .42740E+00 | .41092E-02 | .94075E-01 | .47322E-01 | .62499E+01 |
| .49728E-03 | .48052E+00 | .47273E-02 | .94790E-01 | .47348E-01 | .61096E+01 |
| .56303E-03 | .53823E+00 | .53395E-02 | .93323E-01 | .47385E-01 | .58904E+01 |
| .63535E-03 | .60036E+00 | .59376E-02 | .89368E-01 | .47418E-01 | .55887E+01 |
| .71424E-03 | .66619E+00 | .65151E-02 | .82773E-01 | .47443E-01 | .51867E+01 |
| .80091E-03 | .73544E+00 | .71188E-02 | .73498E-01 | .47458E-01 | .46660E+01 |
| .89624E-03 | .80639E+00 | .78461E-02 | .61888E-01 | .47481E-01 | .40171E+01 |
| .10011E-02 | .87492E+00 | .86435E-02 | .49076E-01 | .47472E-01 | .32572E+01 |
| .11165E-02 | .93253E+00 | .13166E-01 | .37685E-01 | .47467E-01 | .24733E+01 |
| .12363E-02 | .96604E+00 | .11028E-01 | .32241E-01 | .47385E-01 | .18913E+01 |
| .13562E-02 | .97554E+00 | .10879E-01 | .34702E-01 | .47342E-01 | .16399E+01 |
| .14760E-02 | .97411E+00 | .10248E-01 | .43522E-01 | .47224E-01 | .16155E+01 |
| .15958E-02 | .97282E+00 | .93532E-02 | .54270E-01 | .47096E-01 | .16346E+01 |
| .17154E-02 | .97234E+00 | .87367E-02 | .64976E-01 | .46953E-01 | .16363E+01 |
| .18349E-02 | .97140E+00 | .83662E-02 | .75945E-01 | .46812E-01 | .16379E+01 |

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|---|---|---|---|---|---|
| .19545E-02 | .97050E+00 | .80718E-02 | .86758E-01 | .46666E-01 | .16392E+01 |
| .20740E-02 | .96953E+00 | .79814E-02 | .97406E-01 | .46543E-01 | .16388E+01 |
| .21939E-02 | .96845E+00 | .79158E-02 | .10795E+00 | .46414E-01 | .16382E+01 |
| .23131E-02 | .96731E+00 | .80707E-02 | .11839E+00 | .46333E-01 | .16372E+01 |
| .24296E-02 | .96609E+00 | .82145E-02 | .12850E+00 | .46234E-01 | .16359E+01 |
| .25342E-02 | .96493E+00 | .85371E-02 | .13749E+00 | .46214E-01 | .16346E+01 |
| .26269E-02 | .96384E+00 | .87741E-02 | .14542E+00 | .46161E-01 | .16331E+01 |
| .27105E-02 | .96281E+00 | .91425E-02 | .15252E+00 | .46188E-01 | .16318E+01 |
| .27852E-02 | .96188E+00 | .93728E-02 | .15882E+00 | .46159E-01 | .16309E+01 |
| .28540E-02 | .96098E+00 | .97409E-02 | .16449E+00 | .46226E-01 | .16292E+01 |
| .29167E-02 | .96018E+00 | .98920E-02 | .16957E+00 | .46196E-01 | .16278E+01 |
| .29735E-02 | .95945E+00 | .10234E-01 | .17391E+00 | .46307E-01 | .16270E+01 |
| .30263E-02 | .95885E+00 | .10213E-01 | .17758E+00 | .46248E-01 | .16257E+01 |
| .30703E-02 | .95833E+00 | .10538E-01 | .18047E+00 | .46427E-01 | .16255E+01 |
| .31122E-02 | .95797E+00 | .10188E-01 | .18274E+00 | .46264E-01 | .16242E+01 |
| .31510E-02 | .95765E+00 | .10695E-01 | .18414E+00 | .46642E-01 | .16254E+01 |
| .31869E-02 | .95761E+00 | .95035E-02 | .18500E+00 | .46101E-01 | .16230E+01 |
| 0. | 0. | 0. | 0. | .41109E-01 | .55893E+01 |
| .12869E-04 | .12915E-01 | .90154E-05 | .51064E-02 | .41117E-01 | .55834E+01 |
| .27025E-04 | .26948E-01 | .39826E-04 | .10487E-01 | .41126E-01 | .56598E+01 |
| .42468E-04 | .42067E-01 | .94887E-04 | .16085E-01 | .41133E-01 | .57373E+01 |
| .59520E-04 | .58558E-01 | .18157E-03 | .21950E-01 | .41145E-01 | .58162E+01 |
| .78502E-04 | .76662E-01 | .30546E-03 | .28107E-01 | .41158E-01 | .58962E+01 |
| .99415E-04 | .96352E-01 | .47366E-03 | .34457E-01 | .41167E-01 | .59755E+01 |
| .12226E-03 | .11757E+00 | .69031E-03 | .40097E-01 | .41171E-01 | .60522E+01 |
| .13461E-03 | .12912E+00 | .82209E-03 | .44225E-01 | .41180E-01 | .60901E+01 |
| .14735E-03 | .14059E+00 | .96257E-03 | .47409E-01 | .41184E-01 | .61251E+01 |
| .16119E-03 | .15314E+00 | .11263E-02 | .50756E-01 | .41193E-01 | .61606E+01 |
| .17502E-03 | .16562E+00 | .12992E-02 | .53936E-01 | .41198E-01 | .61927E+01 |
| .20959E-03 | .19298E+00 | .17000E-02 | .60387E-01 | .41218E-01 | .62523E+01 |
| .23937E-03 | .22266E+00 | .21955E-02 | .66646E-01 | .41228E-01 | .63017E+01 |
| .27669E-03 | .25511E+00 | .27713E-02 | .72565E-01 | .41252E-01 | .63365E+01 |
| .31787E-03 | .29045E+00 | .34394E-02 | .77995E-01 | .41289E-01 | .63528E+01 |
| .36323E-03 | .32888E+00 | .41833E-02 | .82603E-01 | .41291E-01 | .63445E+01 |
| .41310E-03 | .37059E+00 | .50193E-02 | .86269E-01 | .41306E-01 | .63059E+01 |
| .47134E-03 | .41803E+00 | .59833E-02 | .88799E-01 | .41334E-01 | .62238E+01 |
| .53536E-03 | .47669E+00 | .70235E-02 | .89607E-01 | .41348E-01 | .60870E+01 |
| .60614E-03 | .52733E+00 | .81197E-02 | .88385E-01 | .41373E-01 | .58835E+01 |
| .68400E-03 | .58844E+00 | .92719E-02 | .84833E-01 | .41380E-01 | .55979E+01 |
| .76894E-03 | .65345E+00 | .10461E-01 | .78790E-01 | .41392E-01 | .52160E+01 |
| .86224E-03 | .72231E+00 | .11745E-01 | .70185E-01 | .41382E-01 | .47183E+01 |
| .96487E-03 | .79592E+00 | .13200E-01 | .59263E-01 | .41373E-01 | .40913E+01 |
| .10778E-02 | .86418E+00 | .14986E-01 | .46914E-01 | .41331E-01 | .33423E+01 |

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| .12620E-02 | .92610E+00 | .17168E-01 | .35327E-01 | .42279E-01 | .25388E+01 |
| .13310E-02 | .96509E+00 | .18970E-01 | .28787E-01 | .41152E-01 | .18972E+01 |
| .14600E-02 | .97807E+00 | .19404E-01 | .29868E-01 | .43921E-01 | .15863E+01 |
| .15890E-02 | .97746E+00 | .19071E-01 | .37428E-01 | .43854E-01 | .15387E+01 |
| .17180E-02 | .97614E+00 | .18434E-01 | .47696E-01 | .43649E-01 | .15581E+01 |
| .18467E-02 | .97596E+00 | .18090E-01 | .58108E-01 | .43458E-01 | .15547E+01 |
| .19754E-02 | .97524E+00 | .18057E-01 | .68915E-01 | .40247E-01 | .15524E+01 |
| .21041E-02 | .97452E+00 | .18090E-01 | .79681E-01 | .40059E-01 | .15527E+01 |
| .22328E-02 | .97378E+00 | .18418E-01 | .90299E-01 | .39666E-01 | .15473E+01 |
| .23615E-02 | .97286E+00 | .18782E-01 | .10086E+00 | .39686E-01 | .15439E+01 |
| .24902E-02 | .97189E+00 | .19411E-01 | .11132E+00 | .39548E-01 | .15401E+01 |
| .26157E-02 | .97083E+00 | .20041E-01 | .12148E+00 | .39404E-01 | .15363E+01 |
| .27283E-02 | .96981E+00 | .20817E-01 | .13051E+00 | .39337E-01 | .15328E+01 |
| .28280E-02 | .96884E+00 | .21478E-01 | .13851E+00 | .39254E-01 | .15296E+01 |
| .29181E-02 | .96790E+00 | .22228E-01 | .14567E+00 | .39246E-01 | .15268E+01 |
| .29985E-02 | .96704E+00 | .22813E-01 | .15204E+00 | .39199E-01 | .15240E+01 |
| .30725E-02 | .96622E+00 | .23498E-01 | .15779E+00 | .39240E-01 | .15217E+01 |
| .31401E-02 | .96547E+00 | .23943E-01 | .16295E+00 | .39285E-01 | .15192E+01 |
| .32012E-02 | .96478E+00 | .24541E-01 | .16739E+00 | .39297E-01 | .15176E+01 |
| .32559E-02 | .96422E+00 | .24734E-01 | .17115E+00 | .39246E-01 | .15156E+01 |
| .33055E-02 | .96371E+00 | .25266E-01 | .17412E+00 | .39416E-01 | .15150E+01 |
| .33505E-02 | .96338E+00 | .25020E-01 | .17645E+00 | .39263E-01 | .15132E+01 |
| .33923E-02 | .96305E+00 | .25777E-01 | .17786E+00 | .39661E-01 | .15146E+01 |
| .34389E-02 | .96307E+00 | .24370E-01 | .17872E+00 | .39070E-01 | .15115E+01 |
| 0. | 0. | 0. | 0. | .36364E-01 | .55093E+01 |
| .13767E-04 | .12716E-01 | .18708E-04 | .46172E-02 | .36373E-01 | .55805E+01 |
| .28911E-04 | .26537E-01 | .47972E-04 | .94847E-02 | .36383E-01 | .56939E+01 |
| .45431E-04 | .41431E-01 | .11348E-03 | .14552E-01 | .36391E-01 | .57285E+01 |
| .53672E-04 | .57672E-01 | .21759E-03 | .19864E-01 | .36405E-01 | .58044E+01 |
| .83978E-04 | .75520E-01 | .36785E-03 | .23444E-01 | .36410E-01 | .58816E+01 |
| .10635E-03 | .94926E-01 | .57652E-03 | .31202E-01 | .36429E-01 | .59588E+01 |
| .13079E-03 | .11584E+00 | .83392E-03 | .37047E-01 | .36433E-01 | .60319E+01 |
| .14421E-03 | .12722E+00 | .99465E-03 | .40069E-01 | .36442E-01 | .60685E+01 |
| .15763E-03 | .13852E+00 | .11664E-02 | .42961E-01 | .36445E-01 | .61023E+01 |
| .17243E-03 | .15090E+00 | .13672E-02 | .46003E-01 | .36455E-01 | .61365E+01 |
| .18723E-03 | .16328E+00 | .15798E-02 | .48895E-01 | .36460E-01 | .61676E+01 |
| .21993E-03 | .19038E+00 | .20848E-02 | .54765E-01 | .36482E-01 | .62253E+01 |
| .25606E-03 | .21948E+00 | .26953E-02 | .60470E-01 | .36490E-01 | .62727E+01 |
| .29599E-03 | .25137E+00 | .34144E-02 | .65471E-01 | .36513E-01 | .63063E+01 |
| .34004E-03 | .28617E+00 | .42574E-02 | .70883E-01 | .36521E-01 | .63218E+01 |
| .38857E-03 | .32400E+00 | .52186E-02 | .75871E-01 | .36545E-01 | .63139E+01 |
| .44192E-03 | .36504E+00 | .63103E-02 | .78457E-01 | .36552E-01 | .62767E+01 |
| .50421E-03 | .41232E+00 | .75937E-02 | .80824E-01 | .36574E-01 | .61969E+01 |

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|---|---|---|---|---|---|
| .57270E-03 | .46356E+00 | .90134E-02 | .81645E-01 | .36576E-01 | .60658E+01 |
| .64842E-03 | .51934E+00 | .10553E-01 | .80629E-01 | .36569E-01 | .58701E+01 |
| .73171E-03 | .57961E+00 | .12261E-01 | .77502E-01 | .36579E-01 | .55934E+01 |
| .82257E-03 | .64390E+00 | .14006E-01 | .72109E-01 | .36574E-01 | .52276E+01 |
| .92238E-03 | .71231E+00 | .15970E-01 | .64367E-01 | .36542E-01 | .47470E+01 |
| .10322E-02 | .78531E+00 | .18182E-01 | .54931E-01 | .36505E-01 | .41379E+01 |
| .11530E-02 | .85553E+00 | .20815E-01 | .43062E-01 | .36434E-01 | .34003E+01 |
| .12858E-02 | .92653E+00 | .23915E-01 | .31980E-01 | .36338E-01 | .25860E+01 |
| .14238E-02 | .98394E+00 | .26707E-01 | .25058E-01 | .36169E-01 | .19024E+01 |
| .15619E-02 | .98003E+00 | .27734E-01 | .25032E-01 | .35951E-01 | .15455E+01 |
| .16999E-02 | .98530E+00 | .27710E-01 | .31320E-01 | .35710E-01 | .14723E+01 |
| .18379E-02 | .97898E+00 | .27256E-01 | .40698E-01 | .35435E-01 | .14869E+01 |
| .19756E-02 | .97909E+00 | .27028E-01 | .50417E-01 | .35181E-01 | .14829E+01 |
| .21132E-02 | .97863E+00 | .27300E-01 | .60629E-01 | .34904E-01 | .14767E+01 |
| .22509E-02 | .97813E+00 | .27599E-01 | .70927E-01 | .34645E-01 | .14723E+01 |
| .23886E-02 | .97760E+00 | .28253E-01 | .81105E-01 | .34397E-01 | .14662E+01 |
| .25262E-02 | .97692E+00 | .28956E-01 | .91275E-01 | .34155E-01 | .14603E+01 |
| .26639E-02 | .97617E+00 | .29977E-01 | .10133E+00 | .33953E-01 | .14541E+01 |
| .27981E-02 | .97532E+00 | .31015E-01 | .11118E+00 | .33748E-01 | .14482E+01 |
| .29186E-02 | .97448E+00 | .32162E-01 | .11992E+00 | .33621E-01 | .14430E+01 |
| .30253E-02 | .97366E+00 | .33186E-01 | .12767E+00 | .33491E-01 | .14383E+01 |
| .31216E-02 | .97288E+00 | .34251E-01 | .13460E+00 | .33432E-01 | .14342E+01 |
| .32077E-02 | .97214E+00 | .35140E-01 | .14078E+00 | .33359E-01 | .14303E+01 |
| .32868E-02 | .97143E+00 | .36080E-01 | .14638E+00 | .33344E-01 | .14271E+01 |
| .33591E-02 | .97079E+00 | .36777E-01 | .15141E+00 | .33286E-01 | .14238E+01 |
| .34245E-02 | .97018E+00 | .37569E-01 | .15575E+00 | .33336E-01 | .14214E+01 |
| .34830E-02 | .96970E+00 | .37943E-01 | .15944E+00 | .33276E-01 | .14188E+01 |
| .35360E-02 | .96924E+00 | .38622E-01 | .16236E+00 | .33411E-01 | .14177E+01 |
| .35842E-02 | .96897E+00 | .38450E-01 | .16465E+00 | .33257E-01 | .14154E+01 |
| .36290E-02 | .96863E+00 | .39433E-01 | .16600E+00 | .33650E-01 | .14169E+01 |
| .36703E-02 | .96577E+00 | .37827E-01 | .16684E+00 | .32969E-01 | .14126E+01 |
| 0. | 0. | 0. | 0. | .32669E-01 | .55093E+01 |
| .14608E-04 | .12601E-01 | .12007E-04 | .40173E-02 | .32670E-01 | .55782E+01 |
| .30676E-04 | .26299E-01 | .53621E-04 | .82540E-02 | .32689E-01 | .56493E+01 |
| .48205E-04 | .41064E-01 | .12811E-03 | .12666E-01 | .32697E-01 | .57216E+01 |
| .67560E-04 | .57165E-01 | .24615E-03 | .17293E-01 | .32712E-01 | .57953E+01 |
| .89106E-04 | .74862E-01 | .41560E-03 | .22155E-01 | .32717E-01 | .58702E+01 |
| .11284E-03 | .94104E-01 | .64714E-03 | .27175E-01 | .32737E-01 | .59445E+01 |
| .13877E-03 | .11862E+00 | .94741E-03 | .32272E-01 | .32741E-01 | .60183E+01 |
| .15301E-03 | .12613E+00 | .11311E-02 | .34938E-01 | .32750E-01 | .60518E+01 |
| .16726E-03 | .13733E+00 | .13278E-02 | .37432E-01 | .32754E-01 | .60846E+01 |
| .18298E-03 | .14980E+00 | .15909E-02 | .40088E-01 | .32763E-01 | .61178E+01 |
| .19856E-03 | .16179E+00 | .18022E-02 | .42611E-01 | .32768E-01 | .61480E+01 |

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| .23336E-03 | .18844E+00 | .23840E-02 | .47739E-01 | .32790E-01 | .62039E+01 |
| .27170E-03 | .21749E+00 | .30909E-02 | .52725E-01 | .32795E-01 | .62498E+01 |
| .31406E-03 | .24915E+00 | .39280E-02 | .57451E-01 | .32818E-01 | .62821E+01 |
| .36081E-03 | .28361E+00 | .49163E-02 | .61771E-01 | .32821E-01 | .62965E+01 |
| .41230E-03 | .32105E+00 | .60522E-02 | .65516E-01 | .32842E-01 | .62881E+01 |
| .46890E-03 | .36189E+00 | .73995E-02 | .68497E-01 | .32842E-01 | .62509E+01 |
| .53500E-03 | .40841E+00 | .89063E-02 | .70595E-01 | .32658E-01 | .61721E+01 |
| .60768E-03 | .45907E+00 | .10649E-01 | .71348E-01 | .32848E-01 | .60434E+01 |
| .68802E-03 | .51422E+00 | .12573E-01 | .70901E-01 | .32891E-01 | .58917E+01 |
| .77639E-03 | .57386E+00 | .14708E-01 | .67814E-01 | .32826E-01 | .55832E+01 |
| .87280E-03 | .63757E+00 | .17025E-01 | .63148E-01 | .32806E-01 | .52241E+01 |
| .97871E-03 | .70535E+00 | .19628E-01 | .56420E-01 | .32793E-01 | .47547E+01 |
| .10952E-02 | .77700E+00 | .22566E-01 | .47763E-01 | .32698E-01 | .41583E+01 |
| .12234E-02 | .84940E+00 | .26040E-01 | .37728E-01 | .32682E-01 | .34308E+01 |
| .13643E-02 | .91641E+00 | .30908E-01 | .27749E-01 | .32471E-01 | .26128E+01 |
| .15108E-02 | .96303E+00 | .33817E-01 | .21089E-01 | .32264E-01 | .19011E+01 |
| .16572E-02 | .98157E+00 | .35547E-01 | .20399E-01 | .31972E-01 | .15085E+01 |
| .18037E-02 | .98260E+00 | .35714E-01 | .25452E-01 | .31669E-01 | .14161E+01 |
| .19501E-02 | .98133E+00 | .35388E-01 | .33625E-01 | .31[illegible]E-01 | .14278E+01 |
| .20962E-02 | .98172E+00 | .35268E-01 | .42281E-01 | .31803E-01 | .14212E+01 |
| .22423E-02 | .98151E+00 | .35726E-01 | .51485E-01 | .30865E-01 | .14116E+01 |
| .23883E-02 | .98124E+00 | .36221E-01 | .60832E-01 | .30347E-01 | .14048E+01 |
| .25344E-02 | .98096E+00 | .37114E-01 | .70193E-01 | .30041E-01 | .13963E+01 |
| .26805E-02 | .98052E+00 | .38097E-01 | .79546E-01 | .29739E-01 | .13883E+01 |
| .28266E-02 | .98092E+00 | .39398E-01 | .88825E-01 | .29475E-01 | .13802E+01 |
| .29690E-02 | .97941E+00 | .40758E-01 | .97902E-01 | .29209E-01 | .13726E+01 |
| .30968E-02 | .97879E+00 | .42196E-01 | .10597E+00 | .29020E-01 | .13669E+01 |
| .32100E-02 | .97818E+00 | .43504E-01 | .11314E+00 | .28837E-01 | .13601E+01 |
| .33123E-02 | .97758E+00 | .44806E-01 | .11955E+00 | .28721E-01 | .13550E+01 |
| .34036E-02 | .97782E+00 | .45937E-01 | .12527E+00 | .28995E-01 | .13504E+01 |
| .34876E-02 | .97646E+00 | .47861E-01 | .13045E+00 | .28533E-01 | .13463E+01 |
| .35643E-02 | .97596E+00 | .47953E-01 | .13542E+00 | .28441E-01 | .13424E+01 |
| .35336E-02 | .97549E+00 | .48066E-01 | .13917E+00 | .28436E-01 | .13393E+01 |
| .36951E-02 | .97511E+00 | .49380E-01 | .14260E+00 | .28356E-01 | .13361E+01 |
| .37520E-02 | .97475E+00 | .50124E-01 | .14523E+00 | .28436E-01 | .13344E+01 |
| .38031E-02 | .97456E+00 | .50606E-01 | .14746E+00 | .28279E-01 | .13317E+01 |
| .38506E-02 | .97425E+00 | .51153E-01 | .14869E+00 | .28641E-01 | .13331E+01 |
| .38944E-02 | .97455E+00 | .48703E-01 | .14949E+00 | .27827E-01 | .13269E+01 |
| 0. | 0. | 0. | 0. | .29852E-01 | .55093E+01 |
| .15354E-04 | .12555E-01 | .12974E-04 | .33262E-02 | .29862E-01 | .55766E+01 |
| .32243E-04 | .26204E-01 | .56173E-04 | .68347E-02 | .29873E-01 | .56460E+01 |
| .50668E-04 | .40910E-01 | .13903E-03 | .10409E-01 | .29881E-01 | .57166E+01 |
| .71012E-04 | .56965E-01 | .26748E-03 | .14323E-01 | .29897E-01 | .57887E+01 |

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| .93659E-04 | .74602E-01 | .45199E-03 | .18351E-01 | .29902E-01 | .58619E+01 |
| .11861E-03 | .93780E-01 | .70453E-03 | .22511E-01 | .29923E-01 | .59345E+01 |
| .14986E-03 | .11449E+00 | .10326E-02 | .25736E-01 | .29929E-01 | .60048E+01 |
| .16083E-03 | .12569E+00 | .12336E-02 | .28922E-01 | .29935E-01 | .60395E+01 |
| .17580E-03 | .13685E+00 | .14490E-02 | .31014E-01 | .29938E-01 | .60716E+01 |
| .19231E-03 | .14798E+00 | .17014E-02 | .33215E-01 | .29948E-01 | .61040E+01 |
| .20881E-03 | .16123E+00 | .19696E-02 | .35309E-01 | .29952E-01 | .61334E+01 |
| .24528E-03 | .18777E+00 | .26095E-02 | .39561E-01 | .29974E-01 | .61879E+01 |
| .28998E-03 | .21670E+00 | .33897E-02 | .43698E-01 | .29976E-01 | .62324E+01 |
| .33011E-03 | .24821E+00 | .43169E-02 | .47619E-01 | .29998E-01 | .62633E+01 |
| .37924E-03 | .28249E+00 | .54169E-02 | .51205E-01 | .29997E-01 | .62765E+01 |
| .43337E-03 | .31972E+00 | .66881E-02 | .54319E-01 | .30019E-01 | .62871E+01 |
| .49286E-03 | .36007E+00 | .81574E-02 | .55792E-01 | .30006E-01 | .62290E+01 |
| .56234E-03 | .40650E+00 | .99204E-02 | .58537E-01 | .30019E-01 | .61497E+01 |
| .63673E-03 | .45680E+00 | .11924E-01 | .59187E-01 | .30000E-01 | .60212E+01 |
| .72317E-03 | .51153E+00 | .14164E-01 | .58471E-01 | .29994E-01 | .58307E+01 |
| .81687E-03 | .57072E+00 | .16685E-01 | .56247E-01 | .29956E-01 | .55647E+01 |
| .91740E-03 | .63399E+00 | .19462E-01 | .52381E-01 | .29925E-01 | .52100E+01 |
| .10287E-02 | .70161E+00 | .22620E-01 | .46603E-01 | .29860E-01 | .47471E+01 |
| .11512E-02 | .77290E+00 | .26213E-01 | .39612E-01 | .29787E-01 | .41588E+01 |
| .12859E-02 | .84561E+00 | .30454E-01 | .31238E-01 | .29672E-01 | .34586E+01 |
| .14341E-02 | .91380E+00 | .35317E-01 | .22803E-01 | .29515E-01 | .26209E+01 |
| .15880E-02 | .96254E+00 | .39959E-01 | .16950E-01 | .29277E-01 | .18926E+01 |
| .17419E-02 | .98288E+00 | .42298E-01 | .15988E-01 | .28927E-01 | .14763E+01 |
| .18958E-02 | .98440E+00 | .42669E-01 | .19901E-01 | .28562E-01 | .13780E+01 |
| .20498E-02 | .98319E+00 | .42357E-01 | .26647E-01 | .28154E-01 | .13791E+01 |
| .22033E-02 | .98385E+00 | .42416E-01 | .33928E-01 | .27789E-01 | .13702E+01 |
| .23568E-02 | .98387E+00 | .43063E-01 | .41752E-01 | .27402E-01 | .13576E+01 |
| .25104E-02 | .98282E+00 | .43633E-01 | .49835E-01 | .27236E-01 | .13488E+01 |
| .26639E-02 | .98379E+00 | .44093E-01 | .57873E-01 | .24987E-01 | .13323E+01 |
| .28175E-02 | .98359E+00 | .45869E-01 | [illegible] | [illegible] | .13207E+01 |
| .29710E-02 | .98334E+00 | .47375E-01 | .74046E-01 | [illegible] | [illegible] |
| .31207E-02 | .98000E+00 | .48970E-01 | .81949E-01 | .25890E-01 | .13162E+01 |
| .32551E-02 | .96262E+00 | .50614E-01 | .88975E-01 | .25447E-01 | .13025E+01 |
| .33740E-02 | .98223E+00 | .52130E-01 | .95228E-01 | .25214E-01 | .12958E+01 |
| .34815E-02 | .98184E+00 | .53601E-01 | .10082E+00 | .25044E-01 | .12900E+01 |
| .35775E-02 | .98147E+00 | .54898E-01 | .10581E+00 | .24873E-01 | .12846E+01 |
| .36658E-02 | .98110E+00 | .56136E-01 | .11033E+00 | .24756E-01 | .12799E+01 |
| .37464E-02 | .98077E+00 | .57158E-01 | .11441E+00 | .24624E-01 | .12754E+01 |
| .38193E-02 | .98046E+00 | .58122E-01 | .11795E+00 | .24561E-01 | .12715E+01 |
| .38846E-02 | .98022E+00 | .58729E-01 | .12094E+00 | .24457E-01 | .12679E+01 |
| .39437E-02 | .97999E+00 | .59456E-01 | .12334E+00 | .24473E-01 | .12656E+01 |
| .34974E-02 | .97990E+00 | .59394E-01 | .12519E+00 | .24317E-01 | .12623E+01 |

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| .40473E-02 | .97964E+00 | .60584E-01 | .12625E+00 | .24616E-01 | .17635E+01 |
| .40934E-02 | .98017E+00 | .57195E-01 | .12780E+00 | .23638E-01 | .12543E+01 |
| 0. | 0. | 0. | 0. | .27786E-01 | .55093E+01 |
| .15969E-04 | .12552E-01 | .13652E-04 | .25616E-02 | .27795E-01 | .55754E+01 |
| .33534E-04 | .26201E-01 | .61399E-04 | .52642E-02 | .27807E-01 | .56437E+01 |
| .52697E-04 | .40913E-01 | .14802E-03 | .80792E-02 | .27815E-01 | .57132E+01 |
| .73655E-04 | .56959E-01 | .28258E-03 | .11032E-01 | .27831E-01 | .57841E+01 |
| .97409E-04 | .74596E-01 | .47774E-03 | .14136E-01 | .27836E-01 | .58562E+01 |
| .12335E-03 | .93772E-01 | .74916E-03 | .17341E-01 | .27858E-01 | .59277E+01 |
| .15170E-03 | .11444E+00 | .10929E-02 | .20596E-01 | .27859E-01 | .59968E+01 |
| .16727E-03 | .12568E+00 | .13061E-02 | .22280E-01 | .27869E-01 | .60309E+01 |
| .18284E-03 | .13684E+00 | .15349E-02 | .23891E-01 | .27872E-01 | .60625E+01 |
| .20001E-03 | .14946E+00 | .18031E-02 | .25587E-01 | .27881E-01 | .60943E+01 |
| .21717E-03 | .16120E+00 | .20882E-02 | .27200E-01 | .27885E-01 | .61232E+01 |
| .25518E-03 | .18772E+00 | .27696E-02 | .30476E-01 | .27907E-01 | .61769E+01 |
| .29702E-03 | .21662E+00 | .36022E-02 | .33662E-01 | .27907E-01 | .62198E+01 |
| .34333E-03 | .24809E+00 | .45941E-02 | .36662E-01 | .27927E-01 | .62495E+01 |
| .39443E-03 | .28238E+00 | .57750E-02 | .39443E-01 | .27923E-01 | .62615E+01 |
| .45072E-03 | .31944E+00 | .71449E-02 | .41836E-01 | .27938E-01 | .62507E+01 |
| .51260E-03 | .35967E+00 | .87365E-02 | .43741E-01 | .27926E-01 | .62114E+01 |
| .58485E-03 | .40533E+00 | .10658E-01 | .45088E-01 | .27932E-01 | .61509E+01 |
| .66430E-03 | .45601E+00 | .12858E-01 | .45559E-01 | .27885E-01 | .60013E+01 |
| .75213E-03 | .51048E+00 | .15341E-01 | .45014E-01 | .27893E-01 | .58104E+01 |
| .84874E-03 | .56936E+00 | .18169E-01 | .43292E-01 | .27846E-01 | .55448E+01 |
| .95413E-03 | .63238E+00 | .21378E-01 | .40344E-01 | .27836E-01 | .51917E+01 |
| .10699E-02 | .69962E+00 | .24919E-01 | .35996E-01 | .27730E-01 | .47321E+01 |
| .11973E-02 | .77071E+00 | .29051E-01 | .30444E-01 | .27646E-01 | .41486E+01 |
| .13374E-02 | .84349E+00 | .33935E-01 | .23966E-01 | .27519E-01 | .34340E+01 |
| .14915E-02 | .91232E+00 | .39516E-01 | .17395E-01 | .27364E-01 | .26181E+01 |
| .16516E-02 | .96237E+00 | .44896E-01 | .12726E-01 | .27103E-01 | .18808E+01 |
| .18117E-02 | .98376E+00 | .47754E-01 | .11783E-01 | .26691E-01 | .14496E+01 |
| .19717E-02 | .98574E+00 | .48350E-01 | .14640E-01 | .26260E-01 | .13340E+01 |
| .21318E-02 | .98400E+00 | .48195E-01 | .19806E-01 | .25829E-01 | .13411E+01 |
| .22915E-02 | .98547E+00 | .48216E-01 | .25462E-01 | .25526E-01 | .13302E+01 |
| .24512E-02 | .98569E+00 | .48891E-01 | .31604E-01 | .25805E-01 | .13153E+01 |
| .26109E-02 | .98584E+00 | .49610E-01 | .38018E-01 | .24601E-01 | .13049E+01 |
| .27706E-02 | .98603E+00 | .50778E-01 | .44399E-01 | .24211E-01 | .12930E+01 |
| .29303E-02 | .98605E+00 | .52081E-01 | .50879E-01 | .23819E-01 | .12820E+01 |
| .30899E-02 | .98605E+00 | .53720E-01 | .57327E-01 | .23461E-01 | .12714E+01 |
| .32496E-02 | .98595E+00 | .55469E-01 | .63673E-01 | .23095E-01 | .12615E+01 |
| .33554E-02 | .98581E+00 | .57245E-01 | .69312E-01 | .22807E-01 | .12531E+01 |
| .35191E-02 | .98565E+00 | .58892E-01 | .74336E-01 | .22532E-01 | .12457E+01 |
| .36789E-02 | .98547E+00 | .60461E-01 | .78822E-01 | .22315E-01 | .12392E+01 |

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| .37237E-02 | .98530E+00 | .61859E-01 | .82834E-01 | .22102E-01 | .12334E+01 |
| .38125E-02 | .98512E+00 | .63147E-01 | .86465E-01 | .21936E-01 | .12281E+01 |
| .38964E-02 | .98497E+00 | .64231E-01 | .89739E-01 | .21767E-01 | .12238E+01 |
| .39722E-02 | .98483E+00 | .65191E-01 | .92583E-01 | .21651E-01 | .12186E+01 |
| .40401E-02 | .98474E+00 | .65837E-01 | .94987E-01 | .21521E-01 | .12144E+01 |
| .41016E-02 | .98464E+00 | .66485E-01 | .96917E-01 | .21476E-01 | .12113E+01 |
| .41979E-02 | .98465E+00 | .66485E-01 | .98391E-01 | .21329E-01 | .12077E+01 |
| .42094E-02 | .98447E+00 | .67536E-01 | .99243E-01 | .21532E-01 | .12080E+01 |
| .42573E-02 | .98530E+00 | .62932E-01 | .99882E-01 | .20368E-01 | .11958E+01 |
| 0. | 0. | 0. | 0. | .26371E-01 | .59093E+01 |
| .16425E-04 | .12572E-01 | .14091E-04 | .17400E-02 | .26380E-01 | .55747E+01 |
| .34403E-04 | .26241E-01 | .63504E-04 | .35756E-02 | .26392E-01 | .56422E+01 |
| .54204E-04 | .40977E-01 | .19184E-03 | .54877E-02 | .26400E-01 | .57110E+01 |
| .75967E-04 | .57049E-01 | .29241E-03 | .74935E-02 | .26416E-01 | .57812E+01 |
| .10019E-03 | .74713E-01 | .49448E-03 | .96815E-02 | .26421E-01 | .58525E+01 |
| .12889E-03 | .93919E-01 | .77154E-03 | .11778E-01 | .26443E-01 | .59233E+01 |
| .15604E-03 | .11462E+00 | .11320E-02 | .13988E-01 | .26444E-01 | .59917E+01 |
| .17206E-03 | .12587E+00 | .13532E-02 | .15132E-01 | .26453E-01 | .60254E+01 |
| .18807E-03 | .13709E+00 | .15986E-02 | .16226E-01 | .26436E-01 | .60566E+01 |
| .20572E-03 | .14928E+00 | .18690E-02 | .17377E-01 | .26465E-01 | .60881E+01 |
| .22338E-03 | .16143E+00 | .21652E-02 | .18472E-01 | .26468E-01 | .61165E+01 |
| .26239E-03 | .18798E+00 | .28734E-02 | .20698E-01 | .26490E-01 | .61691E+01 |
| .30551E-03 | .21598E+00 | .37402E-02 | .22858E-01 | .26488E-01 | .62115E+01 |
| .35314E-03 | .24838E+00 | .47744E-02 | .24906E-01 | .26508E-01 | .62402E+01 |
| .40571E-03 | .28259E+00 | .60986E-02 | .26778E-01 | .26500E-01 | .62511E+01 |
| .46360E-03 | .31971E+00 | .74439E-02 | .28488E-01 | .26514E-01 | .62391E+01 |
| .52725E-03 | .35989E+00 | .91173E-02 | .29688E-01 | .26498E-01 | .61985E+01 |
| .60158E-03 | .40618E+00 | .11146E-01 | .30591E-01 | .25901E-01 | .61185E+01 |
| .68329E-03 | .45604E+00 | .13482E-01 | .30908E-01 | .26468E-01 | .59856E+01 |
| .77353E-03 | .51036E+00 | .16134E-01 | .30529E-01 | .26451E-01 | .57935E+01 |
| .87301E-03 | .56905E+00 | .19173E-01 | .29349E-01 | .26397E-01 | .55272E+01 |
| .98141E-03 | .63176E+00 | .22580E-01 | .27310E-01 | .26351E-01 | .51743E+01 |
| .11005E-02 | .69885E+00 | .26522E-01 | .24377E-01 | .26268E-01 | .47161E+01 |
| .12315E-02 | .76974E+00 | .31054E-01 | .20599E-01 | .26178E-01 | .41355E+01 |
| .13756E-02 | .84248E+00 | .36422E-01 | .16191E-01 | .26042E-01 | .34244E+01 |
| .15341E-02 | .91161E+00 | .42545E-01 | .11704E-01 | .25857E-01 | .26106E+01 |
| .16988E-02 | .96239E+00 | .48483E-01 | .84724E-02 | .25581E-01 | .18692E+01 |
| .18635E-02 | .98444E+00 | .51734E-01 | .77477E-02 | .25163E-01 | .14295E+01 |
| .20281E-02 | .98667E+00 | .52493E-01 | .96154E-02 | .24718E-01 | .13082E+01 |
| .21928E-02 | .98958E+00 | .52397E-01 | .13103E-01 | .24241E-01 | .13138E+01 |
| .23570E-02 | .98661E+00 | .52465E-01 | .16964E-01 | .23812E-01 | .13015E+01 |
| .25213E-02 | .98699E+00 | .53196E-01 | .21187E-01 | .23367E-01 | .12849E+01 |
| .26855E-02 | .98729E+00 | .53987E-01 | .25626E-01 | .22939E-01 | .12734E+01 |
| .28498E-02 | .98765E+00 | .55197E-01 | .30066E-01 | .22525E-01 | .12684E+01 |

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|---|---|---|---|---|---|
| .33140E-02 | .98786E+00 | .56574E-01 | .34587E-01 | .22185E-01 | .12486E+01 |
| .31783E-02 | .98805E+00 | .58289E-01 | .39091E-01 | .21719E-01 | .12372E+01 |
| .33384E-02 | .98817E+00 | .60128E-01 | .43536E-01 | .21321E-01 | .12287E+01 |
| .34572E-02 | .98823E+00 | .61976E-01 | .47485E-01 | .21000E-01 | .12177E+01 |
| .36095E-02 | .98826E+00 | .63696E-01 | .51138E-01 | .20692E-01 | .12099E+01 |
| .37244E-02 | .98828E+00 | .65314E-01 | .54191E-01 | .20441E-01 | .12030E+01 |
| .38271E-02 | .98826E+00 | .66752E-01 | .56963E-01 | .20196E-01 | .11967E+01 |
| .39215E-02 | .98825E+00 | .68059E-01 | .59508E-01 | .19994E-01 | .11910E+01 |
| .40078E-02 | .98826E+00 | .69160E-01 | .61801E-01 | .19792E-01 | .11855E+01 |
| .40858E-02 | .98827E+00 | .70092E-01 | .63795E-01 | .19539E-01 | .11805E+01 |
| .41556E-02 | .98831E+00 | .70739E-01 | .65478E-01 | .19484E-01 | .11758E+01 |
| .42188E-02 | .98834E+00 | .71293E-01 | .66832E-01 | .19393E-01 | .11720E+01 |
| .42763E-02 | .98843E+00 | .71353E-01 | .67854E-01 | .19249E-01 | .11681E+01 |
| .43297E-02 | .98836E+00 | .72088E-01 | .68461E-01 | .19346E-01 | .11672E+01 |
| .43790E-02 | .98952E+00 | .66156E-01 | .68938E-01 | .18035E-01 | .11901E+01 |
| 0. | 0. | 0. | 0. | .25545E-01 | .55093E+01 |
| .16703E-04 | .12590E-01 | .14288E-04 | .37558E-03 | .25554E-01 | .55743E+01 |
| .35076E-04 | .26281E-01 | .64494E-04 | .17935E-02 | .25566E-01 | .56614E+01 |
| .55120E-04 | .41038E-01 | .15421E-03 | .27622E-02 | .25574E-01 | .57038E+01 |
| .77251E-04 | .57134E-01 | .29707E-03 | .37724E-02 | .25590E-01 | .57795E+01 |
| .10189E-03 | .74829E-01 | .50246E-03 | .48346E-02 | .25595E-01 | .58505E+01 |
| .12903E-03 | .94658E-01 | .78421E-03 | .59316E-02 | .25617E-01 | .59208E+01 |
| .15868E-03 | .11478E+00 | .11510E-02 | .70463E-02 | .25617E-01 | .59868E+01 |
| .17496E-03 | .12605E+00 | .13761E-02 | .76238E-02 | .25523E-01 | .60224E+01 |
| .19125E-03 | .13724E+00 | .16178E-02 | .81753E-02 | .25629E-01 | .60533E+01 |
| .20921E-03 | .14958E+00 | .19013E-02 | .87564E-02 | .25638E-01 | .60846E+01 |
| .22716E-03 | .16166E+00 | .22031E-02 | .93091E-02 | .25641E-01 | .61120E+01 |
| .26683E-03 | .18824E+00 | .29251E-02 | .10432E-01 | .25662E-01 | .61648E+01 |
| .31068E-03 | .21718E+00 | .38097E-02 | .11525E-01 | .25660E-01 | .62066E+01 |
| .35911E-03 | .24800E+00 | .48664E-02 | .12563E-01 | .25679E-01 | .62340E+01 |
| .41256E-03 | .28298E+00 | .61294E-02 | .13507E-01 | .25678E-01 | .62449E+01 |
| .47144E-03 | .32092E+00 | .76007E-02 | .14328E-01 | .25682E-01 | .62321E+01 |
| .53617E-03 | .36019E+00 | .93203E-02 | .14981E-01 | .25654E-01 | .61906E+01 |
| .61175E-03 | .40635E+00 | .11410E-01 | .15438E-01 | .25665E-01 | .61076E+01 |
| .69484E-03 | .45625E+00 | .13826E-01 | .15599E-01 | .25629E-01 | .59757E+01 |
| .78671E-03 | .51047E+00 | .16577E-01 | .15487E-01 | .25609E-01 | .57826E+01 |
| .88776E-03 | .56904E+00 | .19746E-01 | .14809E-01 | .25552E-01 | .55157E+01 |
| .99808E-03 | .63161E+00 | .23313E-01 | .13776E-01 | .25503E-01 | .51627E+01 |
| .11191E-02 | .69854E+00 | .27457E-01 | .12290E-01 | .25416E-01 | .47051E+01 |
| .12523E-02 | .76929E+00 | .32236E-01 | .10377E-01 | .25323E-01 | .41262E+01 |
| .13989E-02 | .84196E+00 | .37902E-01 | .81461E-02 | .25183E-01 | .34173E+01 |
| .15681E-02 | .91122E+00 | .44362E-01 | .58738E-02 | .24992E-01 | .26053E+01 |
| .17275E-02 | .96248E+00 | .50648E-01 | .42266E-02 | .24709E-01 | .18619E+01 |

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|---|---|---|---|---|---|
| .18950E-02 | .98484E+00 | .54151E-01 | .38406E-02 | .24277E-01 | .14174E+01 |
| .20624E-02 | .98721E+00 | .55020E-01 | .47644E-02 | .23814E-01 | .12928E+01 |
| .22299E-02 | .98815E+00 | .54966E-01 | .65181E-02 | .23321E-01 | .12973E+01 |
| .23969E-02 | .98729E+00 | .55064E-01 | .64711E-02 | .22878E-01 | .12843E+01 |
| .25639E-02 | .98775E+00 | .55828E-01 | .10628E-01 | .22421E-01 | .12667E+01 |
| .27309E-02 | .98815E+00 | .56827E-01 | .12890E-01 | .21979E-01 | .12545E+01 |
| .28980E-02 | .98863E+00 | .57889E-01 | .15166E-01 | .21551E-01 | .12409E+01 |
| .30650E-02 | .98895E+00 | .59304E-01 | .17490E-01 | .21116E-01 | .12286E+01 |
| .32320E-02 | .98928E+00 | .61055E-01 | .19938E-01 | .20713E-01 | .12168E+01 |
| .33949E-02 | .98954E+00 | .62939E-01 | .22100E-01 | .20296E-01 | .12059E+01 |
| .35410E-02 | .98974E+00 | .64821E-01 | .24136E-01 | .19955E-01 | .11966E+01 |
| .36703E-02 | .98989E+00 | .66572E-01 | .25994E-01 | .19628E-01 | .11885E+01 |
| .37874E-02 | .99002E+00 | .68207E-01 | .27575E-01 | .19355E-01 | .11813E+01 |
| .38918E-02 | .99014E+00 | .69658E-01 | .29026E-01 | .19088E-01 | .11747E+01 |
| .39878E-02 | .99025E+00 | .70956E-01 | .30338E-01 | .18863E-01 | .11688E+01 |
| .40755E-02 | .99037E+00 | .72050E-01 | .31520E-01 | .18640E-01 | .11628E+01 |
| .41549E-02 | .99049E+00 | .72946E-01 | .32548E-01 | .18461E-01 | .11574E+01 |
| .42259E-02 | .99062E+00 | .73572E-01 | .33415E-01 | .18289E-01 | .11524E+01 |
| .42902E-02 | .99073E+00 | .74050E-01 | .34113E-01 | .18169E-01 | .11481E+01 |
| .43486E-02 | .99088E+00 | .74143E-01 | .34636E-01 | .18027E-01 | .11440E+01 |
| .44029E-02 | .99082E+00 | .74514E-01 | .34959E-01 | .18028E-01 | .11418E+01 |
| .44530E-02 | .99234E+00 | .67481E-01 | .35211E-01 | .16555E-01 | .11213E+01 |
| 0. | 0. | 0. | 0. | .25278E-01 | .55093E+01 |
| .16796E-04 | .12597E-01 | .14386E-04 | -.22785E-16 | .25288E-01 | .55741E+01 |
| .35272E-04 | .26295E-01 | .64953E-04 | -.47625E-16 | .25308E-01 | .56411E+01 |
| .55427E-04 | .41061E-01 | .15531E-03 | -.74483E-16 | .25287E-01 | .57094E+01 |
| .77682E-04 | .57165E-01 | .29919E-03 | -.10389E-15 | .25324E-01 | .57790E+01 |
| .10246E-03 | .74865E-01 | .50625E-03 | -.13636E-15 | .25328E-01 | .58498E+01 |
| .12975E-03 | .94109E-01 | .78983E-03 | -.17191E-15 | .25350E-01 | .59201E+01 |
| .15956E-03 | .11485E+00 | .11592E-02 | -.21096E-15 | .25350E-01 | .59879E+01 |
| .17594E-03 | .12612E+00 | .13860E-02 | -.23176E-15 | .25350E-01 | .60214E+01 |
| .19232E-03 | .13732E+00 | .16295E-02 | -.25297E-15 | .25362E-01 | .60523E+01 |
| .21037E-03 | .14937E+00 | .19071E-02 | -.27638E-15 | .25371E-01 | .60834E+01 |
| .22843E-03 | .16174E+00 | .22192E-02 | -.29986E-15 | .25374E-01 | .61116E+01 |
| .26832E-03 | .18633E+00 | .29466E-02 | -.35204E-15 | .25395E-01 | .61634E+01 |
| .31241E-03 | .21729E+00 | .38302E-02 | -.41089E-15 | .25392E-01 | .62091E+01 |
| .36112E-03 | .24879E+00 | .49030E-02 | -.47711E-15 | .25411E-01 | .62330E+01 |
| .41487E-03 | .28302E+00 | .61766E-02 | -.55341E-15 | .25401E-01 | .62429E+01 |
| .47407E-03 | .32014E+00 | .76606E-02 | -.64233E-15 | .25413E-01 | .62298E+01 |
| .53916E-03 | .36031E+00 | .93962E-02 | -.74793E-15 | .25394E-01 | .61880E+01 |
| .61516E-03 | .40646E+00 | .11507E-01 | -.88501E-15 | .25394E-01 | .61047E+01 |
| .69872E-03 | .45934E+00 | .13949E-01 | -.10989E-14 | .25397E-01 | .59724E+01 |
| .79110E-03 | .51854E+00 | .16734E-01 | -.12696E-14 | .25337E-01 | .57790E+01 |

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|---|---|---|---|---|---|
| .09272E-03 | .56907E+00 | .19944E-01 | -.16194E-14 | .25278E-01 | .55118E+01 |
| .10036E-02 | .63160E+00 | .23564E-01 | -.20733E-14 | .25228E-01 | .51587E+01 |
| .11253E-02 | .69848E+00 | .27779E-01 | -.27963E-14 | .25140E-01 | .47013E+01 |
| .12593E-02 | .76918E+00 | .32634E-01 | -.40190E-14 | .25045E-01 | .41228E+01 |
| .14067E-02 | .84183E+00 | .38399E-01 | -.63143E-14 | .24903E-01 | .34147E+01 |
| .15688E-02 | .91113E+00 | .44971E-01 | -.11218E-13 | .24711E-01 | .26031E+01 |
| .17371E-02 | .96242E+00 | .51374E-01 | -.22401E-13 | .24425E-01 | .18591E+01 |
| .19055E-02 | .98498E+00 | .54963E-01 | -.47129E-13 | .23989E-01 | .14132E+01 |
| .20739E-02 | .98738E+00 | .55869E-01 | -.96598E-13 | .23519E-01 | .12877E+01 |
| .22423E-02 | .98634E+00 | .55830E-01 | -.17284E-12 | .23022E-01 | .12922E+01 |
| .24103E-02 | .98751E+00 | .55940E-01 | -.26135E-12 | .22575E-01 | .12787E+01 |
| .25782E-02 | .98801E+00 | .55714E-01 | -.35706E-12 | .22113E-01 | .12607E+01 |
| .27462E-02 | .98844E+00 | .57521E-01 | -.46073E-12 | .21667E-01 | .12482E+01 |
| .29141E-02 | .98895E+00 | .58793E-01 | -.56976E-12 | .21234E-01 | .12344E+01 |
| .30821E-02 | .98922E+00 | .60218E-01 | -.68714E-12 | .20794E-01 | .12219E+01 |
| .32501E-02 | .98970E+00 | .61979E-01 | -.81307E-12 | .20385E-01 | .12100E+01 |
| .34138E-02 | .99000E+00 | .63873E-01 | -.94721E-12 | .19961E-01 | .11989E+01 |
| .35608E-02 | .99025E+00 | .65754E-01 | -.11770E-11 | .19614E-01 | .11895E+01 |
| .36910E-02 | .99045E+00 | .67522E-01 | -.12019E-11 | .19279E-01 | .11613E+01 |
| .38085E-02 | .99063E+00 | .69159E-01 | -.13223E-11 | .18998E-01 | .11740E+01 |
| .39135E-02 | .99079E+00 | .70608E-01 | -.14376E-11 | .18724E-01 | .11674E+01 |
| .40101E-02 | .99094E+00 | .71899E-01 | -.15497E-11 | .18489E-01 | .11611E+01 |
| .40983E-02 | .99110E+00 | .72982E-01 | -.16578E-11 | .18258E-01 | .11552E+01 |
| .41780E-02 | .99126E+00 | .73860E-01 | -.17592E-11 | .18070E-01 | .11497E+01 |
| .42494E-02 | .99142E+00 | .74472E-01 | -.18523E-11 | .17891E-01 | .11445E+01 |
| .43141E-02 | .99157E+00 | .74919E-01 | -.19367E-11 | .17761E-01 | .11400E+01 |
| .43729E-02 | .99173E+00 | .75022E-01 | -.20103E-11 | .17620E-01 | .11357E+01 |
| .44275E-02 | .99182E+00 | .75226E-01 | -.20729E-11 | .17582E-01 | .11330E+01 |
| .44779E-02 | .99342E+00 | .67750E-01 | -.21221E-11 | .16059E-01 | .11111E+01 |
| .40000E-01 | .41000E-01 | .42000E-01 | .43000E-01 | .44000E-01 | .45000E-01 |
| .46000E-01 | .47000E-01 | .48000E-01 | .49000E-01 | .50000E-01 | |

SOLUTION AT X = .40000E-01

AT FI = 0.00 CFINF = .22421E-01 SFINF = .10458E+00 SHOCK DISTANCE = .18226E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .13899E+00 | .55093E+01 | .55093E+01 |
| .68363E-05 | .16511E-01 | -.10453E-04 | -.65041E-68 | .13897E+00 | .56204E+01 | .56239E+01 |
| .14356E-04 | .34378E-01 | -.45701E-04 | -.13525E-67 | .13895E+00 | .57347E+01 | .57498E+01 |
| .22560E-04 | .53551E-01 | -.11051E-03 | -.21006E-67 | .13893E+00 | .58506E+01 | .58873E+01 |
| .31618E-04 | .74374E-01 | -.21375E-03 | -.29025E-67 | .13890E+00 | .59683E+01 | .60391E+01 |
| .41703E-04 | .97173E-01 | -.36488E-03 | -.37615E-67 | .13888E+00 | .60877E+01 | .62086E+01 |
| .52811E-04 | .12188E+00 | -.57415E-03 | -.46615E-67 | .13885E+00 | .62056E+01 | .63957E+01 |
| .64944E-04 | .14842E+00 | -.85010E-03 | -.55823E-67 | .13883E+00 | .63191E+01 | .66011E+01 |
| .71611E-04 | .16283E+00 | -.10215E-02 | -.60872E-67 | .13881E+00 | .63758E+01 | .67144E+01 |
| .78278E-04 | .17713E+00 | -.12064E-02 | -.65090E-67 | .13880E+00 | .64264E+01 | .68280E+01 |
| .85625E-04 | .19277E+00 | -.14251E-02 | -.69791E-67 | .13878E+00 | .64781E+01 | .69538E+01 |
| .92976E-04 | .20829E+00 | -.16591E-02 | -.74183E-67 | .13877E+00 | .65246E+01 | .70880E+01 |
| .10921E-03 | .24218E+00 | -.22256E-02 | -.82749E-67 | .13873E+00 | .66095E+01 | .73603E+01 |
| .12716E-03 | .27905E+00 | -.29251E-02 | -.90253E-67 | .13872E+00 | .66758E+01 | .76726E+01 |
| .14698E-03 | .31915E+00 | -.37731E-02 | -.98011E-67 | .13868E+00 | .67178E+01 | .80209E+01 |
| .16886E-03 | .36269E+00 | -.47895E-02 | -.99173E-67 | .13867E+00 | .67248E+01 | .84089E+01 |
| .19296E-03 | .43983E+00 | -.59814E-02 | -.98752E-67 | .13864E+00 | .66895E+01 | .88399E+01 |
| .21945E-03 | .46065E+00 | -.73607E-02 | -.93799E-67 | .13864E+00 | .65998E+01 | .93166E+01 |
| .25038E-03 | .51858E+00 | -.90135E-02 | -.82376E-67 | .13864E+00 | .64308E+01 | .98741E+01 |
| .28439E-03 | .58030E+00 | -.10845E-01 | -.64159E-67 | .13867E+00 | .61710E+01 | .10483E+02 |
| .32199E-03 | .64562E+00 | -.12001E-01 | -.39199E-67 | .13870E+00 | .58025E+01 | .11140E+02 |
| .36336E-03 | .71305E+00 | -.14805E-01 | -.94423E-68 | .13877E+00 | .53154E+01 | .11826E+02 |
| .40849E-03 | .77977E+00 | -.16733E-01 | .20582E-67 | .13885E+00 | .47158E+01 | .12502E+02 |
| .45802E-03 | .84234E+00 | -.18413E-01 | .44132E-67 | .13895E+00 | .40278E+01 | .13114E+02 |
| .51256E-03 | .89485E+00 | -.19914E-01 | .53112E-67 | .13901E+00 | .33245E+01 | .13579E+02 |
| .57256E-03 | .93053E+00 | -.21556E-01 | .43963E-67 | .13901E+00 | .27343E+01 | .13824E+02 |
| .63853E-03 | .94660E+00 | -.23865E-01 | .24874E-67 | .13888E+00 | .23850E+01 | .13862E+02 |
| .70704E-03 | .94833E+00 | -.26883E-01 | .11602E-67 | .13860E+00 | .22954E+01 | .13811E+02 |
| .77558E-03 | .94591E+00 | -.30499E-01 | .74311E-68 | .13811E+00 | .23284E+01 | .13793E+02 |
| .84412E-03 | .94419E+00 | -.34437E-01 | .59732E-68 | .13752E+00 | .23898E+01 | .13798E+02 |
| .91266E-03 | .94280E+00 | -.38344E-01 | .50643E-68 | .13680E+00 | .24021E+01 | .13798E+02 |
| .98104E-03 | .94136E+00 | -.42334E-01 | .45879E-68 | .13600E+00 | .24324E+01 | .13795E+02 |
| .10494E-02 | .93999E+00 | -.46323E-01 | .43865E-68 | .13509E+00 | .24616E+01 | .13799E+02 |
| .11178E-02 | .93861E+00 | -.50388E-01 | .34991E-68 | .13408E+00 | .24980E+01 | .13799E+02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .11861E-02 | .93723E+00 | -.54438E-01 | .28543E-68 | .13300E+00 | .25181E+01 | .13800E+02 |
| .12545E-02 | .93363E+00 | -.58558E-01 | .22180E-68 | .13180E+00 | .25457E+01 | .13800E+02 |
| .13229E-02 | .93344E+00 | -.62657E-01 | .16522E-68 | .13059E+00 | .25729E+01 | .13800E+02 |
| .13895E-02 | .93309E+00 | -.66718E-01 | .11886E-68 | .12918E+00 | .25986E+01 | .13800E+02 |
| .14493E-02 | .93189E+00 | -.70331E-01 | .84876E-69 | .12794E+00 | .26208E+01 | .13800E+02 |
| .15023E-02 | .93088E+00 | -.73578E-01 | .60191E-69 | .12672E+00 | .26396E+01 | .13800E+02 |
| .15531E-02 | .92994E+00 | -.76472E-01 | .41966E-69 | .12562E+00 | .26558E+01 | .13800E+02 |
| .15929E-02 | .92915E+00 | -.79099E-01 | .28880E-69 | .12453E+00 | .26693E+01 | .13800E+02 |
| .16322E-02 | .92846E+00 | -.81465E-01 | .19453E-69 | .12358E+00 | .26810E+01 | .13800E+02 |
| .16681E-02 | .92786E+00 | -.83679E-01 | .12940E-69 | .12256E+00 | .26906E+01 | .13800E+02 |
| .17005E-02 | .92734E+00 | -.85610E-01 | .87013E-70 | .12172E+00 | .26986E+01 | .13800E+02 |
| .17296E-02 | .92692E+00 | -.87420E-01 | .60146E-70 | .12082E+00 | .27047E+01 | .13800E+02 |
| .17559E-02 | .92656E+00 | -.88942E-01 | .43429E-70 | .12015E+00 | .27096E+01 | .13800E+02 |
| .17799E-02 | .92628E+00 | -.90485E-01 | .30148E-70 | .11930E+00 | .27129E+01 | .13800E+02 |
| .18021E-02 | .92604E+00 | -.91654E-01 | .19667E-70 | .11884E+00 | .27157E+01 | .13800E+02 |
| .18226E-02 | .92586E+00 | -.93178E-01 | 0. | .11781E+00 | .27164E+01 | .13800E+02 |

AT FI = 120.00 DFINF = .85747E-02 STINF = .32008E-01 SHOCK DISTANCE = .36703E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .36364E-01 | .55093E+01 | .55093E+01 |
| .13767E-04 | .12716E-01 | .10700E-04 | .46172E-02 | .36373E-01 | .55805E+01 | .55828E+01 |
| .28911E-04 | .26537E-01 | .47547E-04 | .94847E-02 | .36383E-01 | .56539E+01 | .56641E+01 |
| .45431E-04 | .41431E-01 | .11348E-03 | .14552E-01 | .36391E-01 | .57285E+01 | .57532E+01 |
| .63672E-04 | .57672E-01 | .21769E-03 | .19864E-01 | .36405E-01 | .58044E+01 | .58520E+01 |
| .83981E-04 | .75520E-01 | .36709E-03 | .25444E-01 | .36410E-01 | .58816E+01 | .59629E+01 |
| .10635E-03 | .94926E-01 | .57062E-03 | .31202E-01 | .36429E-01 | .59580E+01 | .60858E+01 |
| .13078E-03 | .11584E+00 | .83392E-03 | .37047E-01 | .36433E-01 | .60319E+01 | .62212E+01 |
| .14421E-03 | .12722E+00 | .99465E-03 | .40059E-01 | .36442E-01 | .60689E+01 | .62982E+01 |
| .15763E-03 | .13852E+00 | .11664E-02 | .42961E-01 | .36446E-01 | .61023E+01 | .63715E+01 |
| .17243E-03 | .15090E+00 | .13672E-02 | .46043E-01 | .36455E-01 | .61365E+01 | .64551E+01 |
| .18723E-03 | .16320E+00 | .15798E-02 | .48895E-01 | .36460E-01 | .61676E+01 | .65392E+01 |
| .21993E-03 | .19068E+00 | .20848E-02 | .54765E-01 | .36482E-01 | .62253E+01 | .67262E+01 |
| .25607E-03 | .21940E+00 | .26953E-02 | .60478E-01 | .36490E-01 | .62727E+01 | .69357E+01 |
| .29599E-03 | .25137E+00 | .34144E-02 | .65871E-01 | .36513E-01 | .63063E+01 | .71708E+01 |
| .34805E-03 | .28617E+00 | .42574E-02 | .70833E-01 | .36521E-01 | .63218E+01 | .74344E+01 |
| .38857E-03 | .32400E+00 | .52186E-02 | .75071E-01 | .36545E-01 | .63139E+01 | .77301E+01 |
| .44192E-03 | .36504E+00 | .63103E-02 | .78457E-01 | .36552E-01 | .62767E+01 | .80617E+01 |
| .50421E-03 | .41232E+00 | .75937E-02 | .80824E-01 | .36574E-01 | .61969E+01 | .84574E+01 |

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|---|---|---|---|---|---|---|
| .57270E-03 | .46398E+00 | .90134E-02 | .81849E-01 | .36576E-01 | .60658E+01 | .89027E+01 |
| .64842E-03 | .51934E+00 | .10553E-01 | .81629E-01 | .36589E-01 | .58701E+01 | .94071E+01 |
| .73172E-03 | .57961E+00 | .12226E-01 | .77502E-01 | .36579E-01 | .55954E+01 | .99743E+01 |
| .82260E-03 | .64390E+00 | .14006E-01 | .72109E-01 | .36574E-01 | .52276E+01 | .10504E+02 |
| .92235E-03 | .71231E+00 | .15970E-01 | .64367E-01 | .36542E-01 | .47470E+01 | .11298E+02 |
| .10322E-02 | .78381E+00 | .18182E-01 | .54451E-01 | .36505E-01 | .41379E+01 | .12044E+02 |
| .11530E-02 | .85553E+00 | .20815E-01 | .43062E-01 | .36434E-01 | .34003E+01 | .12798E+02 |
| .12859E-02 | .92053E+00 | .23915E-01 | .31988E-01 | .36338E-01 | .25860E+01 | .13453E+02 |
| .14238E-02 | .96394E+00 | .26707E-01 | .25056E-01 | .36169E-01 | .19024E+01 | .13813E+02 |
| .15618E-02 | .98003E+00 | .27784E-01 | .23032E-01 | .35951E-01 | .15455E+01 | .13857E+02 |
| .16999E-02 | .98030E+00 | .27710E-01 | .31320E-01 | .35718E-01 | .14723E+01 | .13795E+02 |
| .18379E-02 | .97898E+00 | .27256E-01 | .43638E-01 | .35435E-01 | .14869E+01 | .13785E+02 |
| .19758E-02 | .97909E+00 | .27028E-01 | .50417E-01 | .35181E-01 | .14829E+01 | .13795E+02 |
| .21132E-02 | .97853E+00 | .27308E-01 | .53629E-01 | .34901E-01 | .14767E+01 | .13792E+02 |
| .22509E-02 | .97813E+00 | .27599E-01 | .70927E-01 | .34645E-01 | .14723E+01 | .13793E+02 |
| .23885E-02 | .97750E+00 | .28253E-01 | .81105E-01 | .34397E-01 | .14662E+01 | .13794E+02 |
| .25262E-02 | .97692E+00 | .28966E-01 | .91275E-01 | .34155E-01 | .14603E+01 | .13794E+02 |
| .26639E-02 | .97617E+00 | .29977E-01 | .10135E+00 | .33953E-01 | .14541E+01 | .13794E+02 |
| .27981E-02 | .97532E+00 | .31019E-01 | .11118E+00 | .33748E-01 | .14482E+01 | .13795E+02 |
| .29186E-02 | .97448E+00 | .32165E-01 | .11992E+00 | .33621E-01 | .14430E+01 | .13795E+02 |
| .30253E-02 | .97366E+00 | .33186E-01 | .12767E+00 | .33491E-01 | .14383E+01 | .13796E+02 |
| .31216E-02 | .97288E+00 | .34291E-01 | .13460E+00 | .33432E-01 | .14342E+01 | .13796E+02 |
| .32077E-02 | .97214E+00 | .35160E-01 | .14078E+00 | .33350E-01 | .14303E+01 | .13797E+02 |
| .32869E-02 | .97143E+00 | .36000E-01 | .14638E+00 | .33344E-01 | .14271E+01 | .13797E+02 |
| .33592E-02 | .97079E+00 | .36777E-01 | .15141E+00 | .33288E-01 | .14238E+01 | .13798E+02 |
| .34245E-02 | .97018E+00 | .37569E-01 | .15575E+00 | .33336E-01 | .14214E+01 | .13798E+02 |
| .34830E-02 | .96970E+00 | .37943E-01 | .15944E+00 | .33276E-01 | .14188E+01 | .13799E+02 |
| .35360E-02 | .96924E+00 | .38622E-01 | .16236E+00 | .33411E-01 | .14177E+01 | .13799E+02 |
| .35842E-02 | .96897E+00 | .38450E-01 | .16465E+00 | .33257E-01 | .14154E+01 | .13799E+02 |
| .36290E-02 | .96863E+00 | .39433E-01 | .16500E+00 | .33650E-01 | .14169E+01 | .13799E+02 |
| .36703E-02 | .96877E+00 | .37627E-01 | .16684E+00 | .32989E-01 | .14126E+01 | .13800E+02 |

AT FI = 130.00 CFINF = .80082E-02 SFINF = .29192E-01 SHOCK DISTANCE = .38944E-02

| Y | U | V | W | P | M | M TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .32869E-01 | .55093E+01 | .55093E+01 |
| .14507E-04 | .12601E-01 | .12007E-04 | .40173E-02 | .32678E-01 | .55782E+01 | .55804E+01 |
| .30676E-04 | .26291E-01 | .53621E-04 | .82540E-02 | .32689E-01 | .56493E+01 | .56590E+01 |
| .48204E-04 | .41806E-01 | .12811E-03 | .12666E-01 | .32697E-01 | .57216E+01 | .57492E+01 |
| .67560E-04 | .57168E-01 | .24615E-03 | .17293E-01 | .32712E-01 | .57953E+01 | .58410E+01 |

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|---|---|---|---|---|---|---|
| .89109E-04 | .74862E-01 | .41566E-03 | .22155E-01 | .32717E-01 | .58702E+01 | .59482E+01 |
| .11284E-03 | .94104E-01 | .64714E-03 | .27175E-01 | .32737E-01 | .59445E+01 | .60673E+01 |
| .13877E-03 | .11485E+00 | .94741E-03 | .32272E-01 | .32741E-01 | .60163E+01 | .61985E+01 |
| .15301E-03 | .12613E+00 | .11311E-02 | .34908E-01 | .32750E-01 | .60518E+01 | .62710E+01 |
| .16726E-03 | .13733E+00 | .13278E-02 | .37432E-01 | .32754E-01 | .60846E+01 | .63440E+01 |
| .18296E-03 | .14960E+00 | .15580E-02 | .40086E-01 | .32763E-01 | .61178E+01 | .64249E+01 |
| .19866E-03 | .16179E+00 | .18022E-02 | .42511E-01 | .32768E-01 | .61480E+01 | .65063E+01 |
| .23336E-03 | .18844E+00 | .23840E-02 | .47739E-01 | .32790E-01 | .62039E+01 | .66877E+01 |
| .27170E-03 | .21749E+00 | .30909E-02 | .52725E-01 | .32795E-01 | .62498E+01 | .68920E+01 |
| .31406E-03 | .24915E+00 | .39280E-02 | .57451E-01 | .32818E-01 | .62821E+01 | .71191E+01 |
| .36081E-03 | .28361E+00 | .49163E-02 | .61771E-01 | .32821E-01 | .62965E+01 | .73752E+01 |
| .41230E-03 | .32105E+00 | .60522E-02 | .65516E-01 | .32842E-01 | .62881E+01 | .76628E+01 |
| .46890E-03 | .36165E+00 | .73559E-02 | .68497E-01 | .32842E-01 | .62509E+01 | .79858E+01 |
| .53500E-03 | .40841E+00 | .89063E-02 | .70590E-01 | .32858E-01 | .61721E+01 | .83719E+01 |
| .60767E-03 | .45907E+00 | .10649E-01 | .71548E-01 | .32848E-01 | .60434E+01 | .88075E+01 |
| .68801E-03 | .51422E+00 | .12573E-01 | .70501E-01 | .32851E-01 | .58517E+01 | .93019E+01 |
| .77639E-03 | .57386E+00 | .14708E-01 | .67914E-01 | .32826E-01 | .55832E+01 | .98601E+01 |
| .87282E-03 | .63757E+00 | .17025E-01 | .63148E-01 | .32806E-01 | .52241E+01 | .10482E+02 |
| .97867E-03 | .70555E+00 | .19626E-01 | .56420E-01 | .32755E-01 | .47547E+01 | .11172E+02 |
| .10952E-02 | .77700E+00 | .22566E-01 | .47763E-01 | .32698E-01 | .41583E+01 | .11922E+02 |
| .12236E-02 | .84940E+00 | .26040E-01 | .37729E-01 | .32602E-01 | .34306E+01 | .12692E+02 |
| .13644E-02 | .91641E+00 | .30056E-01 | .27749E-01 | .32471E-01 | .26128E+01 | .13384E+02 |
| .15107E-02 | .96305E+00 | .33817E-01 | .21089E-01 | .32264E-01 | .19011E+01 | .13792E+02 |
| .16572E-02 | .98157E+00 | .35547E-01 | .20399E-01 | .31972E-01 | .15085E+01 | .13863E+02 |
| .18047E-02 | .98260E+00 | .35714E-01 | .25452E-01 | .31669E-01 | .14161E+01 | .13799E+02 |
| .19501E-02 | .98133E+00 | .35388E-01 | .33625E-01 | .31317E-01 | .14278E+01 | .13785E+02 |
| .20962E-02 | .98172E+00 | .35288E-01 | .42281E-01 | .31003E-01 | .14212E+01 | .13798E+02 |
| .22422E-02 | .98151E+00 | .35726E-01 | .51485E-01 | .30665E-01 | .14116E+01 | .13793E+02 |
| .23884E-02 | .98124E+00 | .36221E-01 | .60882E-01 | .30347E-01 | .14048E+01 | .13793E+02 |
| .25344E-02 | .98096E+00 | .37114E-01 | .70193E-01 | .30041E-01 | .13963E+01 | .13794E+02 |
| .26805E-02 | .98032E+00 | .38097E-01 | .79546E-01 | .29739E-01 | .13883E+01 | .13794E+02 |
| .28266E-02 | .98002E+00 | .39398E-01 | .88825E-01 | .29475E-01 | .13802E+01 | .13795E+02 |
| .29690E-02 | .97911E+00 | .40798E-01 | .97902E-01 | .29208E-01 | .13726E+01 | .13795E+02 |
| .30968E-02 | .97879E+00 | .42196E-01 | .10597E+00 | .28920E-01 | .13660E+01 | .13795E+02 |
| .32100E-02 | .97818E+00 | .43504E-01 | .11314E+00 | .28837E-01 | .13601E+01 | .13796E+02 |
| .33122E-02 | .97758E+00 | .44808E-01 | .11955E+00 | .28721E-01 | .13500E+01 | .13795E+02 |
| .34035E-02 | .97702E+00 | .45937E-01 | .12527E+00 | .28595E-01 | .13504E+01 | .13797E+02 |
| .34876E-02 | .97646E+00 | .47061E-01 | .13145E+00 | .28533E-01 | .13463E+01 | .13797E+02 |
| .35643E-02 | .97596E+00 | .47953E-01 | .13512E+00 | .28441E-01 | .13424E+01 | .13798E+02 |
| .36336E-02 | .97549E+00 | .48866E-01 | .13917E+00 | .28436E-01 | .13393E+01 | .13798E+02 |
| .36957E-02 | .97511E+00 | .49380E-01 | .14260E+00 | .23356E-01 | .13361E+01 | .13798E+02 |
| .37519E-02 | .97475E+00 | .50124E-01 | .14533E+00 | .28436E-01 | .13344E+01 | .13799E+02 |
| .38031E-02 | .97456E+00 | .50008E-01 | .14746E+00 | .28279E-01 | .13317E+01 | .13799E+02 |

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|---|---|---|---|---|---|---|
| .38506E-02 | .97425E+00 | .51153E-01 | .14869E+00 | .28641E-01 | .13331E+01 | .13799E+02 |
| .38944E-02 | .97455E+00 | .48703E-01 | .14949E+00 | .27827E-01 | .13269E+01 | .13800E+02 |

AT FI = 140.00 CTIME = .75911E-02 STINF = .27127E-01 SHOCK DISTANCE = .40934E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .29852E-01 | .55093E+01 | .55093E+01 |
| .15394E-04 | .12555E-01 | .12974E-04 | .33262E-02 | .29862E-01 | .55766E+01 | .55788E+01 |
| .32243E-04 | .26204E-01 | .58173E-04 | .68347E-02 | .29873E-01 | .56460E+01 | .56554E+01 |
| .50668E-04 | .40918E-01 | .13905E-03 | .10489E-01 | .29881E-01 | .57166E+01 | .57394E+01 |
| .71012E-04 | .56965E-01 | .26748E-03 | .14323E-01 | .29897E-01 | .57887E+01 | .58329E+01 |
| .93662E-04 | .74602E-01 | .45199E-03 | .18351E-01 | .29902E-01 | .58619E+01 | .59375E+01 |
| .11861E-03 | .93780E-01 | .70453E-03 | .22511E-01 | .29923E-01 | .59345E+01 | .60536E+01 |
| .14586E-03 | .11445E+00 | .10326E-02 | .26736E-01 | .29929E-01 | .60048E+01 | .61816E+01 |
| .16083E-03 | .12569E+00 | .12336E-02 | .28922E-01 | .29935E-01 | .60395E+01 | .62524E+01 |
| .17581E-03 | .13686E+00 | .14490E-02 | .31014E-01 | .29938E-01 | .60716E+01 | .63237E+01 |
| .19231E-03 | .14908E+00 | .17014E-02 | .33215E-01 | .29948E-01 | .61040E+01 | .64026E+01 |
| .20882E-03 | .16123E+00 | .19696E-02 | .35309E-01 | .29952E-01 | .61334E+01 | .64821E+01 |
| .24528E-03 | .18777E+00 | .26095E-02 | .39561E-01 | .29974E-01 | .61879E+01 | .66593E+01 |
| .26558E-03 | .21670E+00 | .33897E-02 | .43698E-01 | .29976E-01 | .62324E+01 | .68581E+01 |
| .33011E-03 | .24821E+00 | .43169E-02 | .47519E-01 | .29998E-01 | .62633E+01 | .70811E+01 |
| .37925E-03 | .28249E+00 | .54169E-02 | .51205E-01 | .29997E-01 | .62765E+01 | .73319E+01 |
| .43336E-03 | .31972E+00 | .66881E-02 | .54315E-01 | .30015E-01 | .62671E+01 | .76139E+01 |
| .49286E-03 | .36007E+00 | .81574E-02 | .56792E-01 | .30008E-01 | .62290E+01 | .79307E+01 |
| .56234E-03 | .40650E+00 | .99204E-02 | .58537E-01 | .30019E-01 | .61497E+01 | .83099E+01 |
| .63872E-03 | .45680E+00 | .11924E-01 | .59167E-01 | .30000E-01 | .60212E+01 | .87388E+01 |
| .72317E-03 | .51153E+00 | .14164E-01 | .58471E-01 | .29994E-01 | .58307E+01 | .92263E+01 |
| .81607E-03 | .57072E+00 | .16685E-01 | .56247E-01 | .29955E-01 | .55647E+01 | .97780E+01 |
| .91742E-03 | .63399E+00 | .19462E-01 | .52381E-01 | .29925E-01 | .52100E+01 | .10395E+02 |
| .10287E-02 | .70161E+00 | .22626E-01 | .46803E-01 | .29860E-01 | .47471E+01 | .11083E+02 |
| .11512E-02 | .77290E+00 | .26213E-01 | .39812E-01 | .29787E-01 | .41588E+01 | .11834E+02 |
| .12859E-02 | .84561E+00 | .30454E-01 | .31238E-01 | .29672E-01 | .34386E+01 | .12616E+02 |
| .14341E-02 | .91380E+00 | .35317E-01 | .22823E-01 | .29515E-01 | .26209E+01 | .13332E+02 |
| .15879E-02 | .96254E+00 | .39959E-01 | .16950E-01 | .29277E-01 | .18926E+01 | .13776E+02 |
| .17419E-02 | .98260E+00 | .42206E-01 | .15988E-01 | .28927E-01 | .14763E+01 | .13866E+02 |
| .18958E-02 | .98440E+00 | .42689E-01 | .19301E-01 | .28562E-01 | .13760E+01 | .13802E+02 |
| .20498E-02 | .98319E+00 | .42457E-01 | .26647E-01 | .28154E-01 | .13791E+01 | .13785E+02 |
| .22033E-02 | .98385E+00 | .42426E-01 | .33926E-01 | .27789E-01 | .13702E+01 | .13798E+02 |
| .23568E-02 | .98387E+00 | .43003E-01 | .41752E-01 | .27402E-01 | .13576E+01 | .13794E+02 |

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|---|---|---|---|---|---|---|
| .25104E-02 | .98382E+00 | .43633E-01 | .49835E-01 | .27036E-01 | .13488E+01 | .13794E+02 |
| .26639E-02 | .98379E+00 | .44693E-01 | .57870E-01 | .26661E-01 | .13383E+01 | .13795E+02 |
| .28175E-02 | .98359E+00 | .45869E-01 | .65981E-01 | .26328E-01 | .13287E+01 | .13795E+02 |
| .29710E-02 | .98336E+00 | .47375E-01 | .74040E-01 | .26011E-01 | .13191E+01 | .13795E+02 |
| .31207E-02 | .98300E+00 | .48970E-01 | .81949E-01 | .25690E-01 | .13102E+01 | .13795E+02 |
| .32586E-02 | .98262E+00 | .50614E-01 | .88975E-01 | .25447E-01 | .13025E+01 | .13796E+02 |
| .33741E-02 | .98223E+00 | .52130E-01 | .93228E-01 | .25214E-01 | .12958E+01 | .13796E+02 |
| .34815E-02 | .98184E+00 | .53601E-01 | .10032E+00 | .25044E-01 | .12900E+01 | .13796E+02 |
| .35773E-02 | .98147E+00 | .54858E-01 | .13981E+00 | .24873E-01 | .12846E+01 | .13797E+02 |
| .36658E-02 | .98110E+00 | .56136E-01 | .11033E+00 | .24756E-01 | .12799E+01 | .13797E+02 |
| .37464E-02 | .98077E+00 | .57158E-01 | .11441E+00 | .24624E-01 | .12754E+01 | .13797E+02 |
| .38193E-02 | .98046E+00 | .58122E-01 | .11795E+00 | .24561E-01 | .12718E+01 | .13798E+02 |
| .38845E-02 | .98022E+00 | .58729E-01 | .12094E+00 | .24457E-01 | .12679E+01 | .13798E+02 |
| .39437E-02 | .97999E+00 | .59456E-01 | .12334E+00 | .24473E-01 | .12656E+01 | .13798E+02 |
| .39974E-02 | .97983E+00 | .59394E-01 | .12519E+00 | .24317E-01 | .12623E+01 | .13799E+02 |
| .40473E-02 | .97964E+00 | .60584E-01 | .12625E+00 | .24616E-01 | .12635E+01 | .13799E+02 |
| .40934E-02 | .98017E+00 | .57195E-01 | .12700E+00 | .23638E-01 | .12543E+01 | .13800E+02 |

AT FI = 150.00 CFINF = .72971E-02 SFINF = .25618E-01 SHOCK DISTANCE = .42573E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .27786E-01 | .55093E+01 | .55093E+01 |
| .15989E-04 | .12592E-01 | .13892E-04 | .25818E-02 | .27795E-01 | .55754E+01 | .55773E+01 |
| .33534E-04 | .26241E-01 | .51399E-04 | .52642E-02 | .27807E-01 | .56437E+01 | .56528E+01 |
| .52696E-04 | .40913E-01 | .14680E-03 | .80792E-02 | .27815E-01 | .57132E+01 | .57355E+01 |
| .73835E-04 | .56959E-01 | .28258E-03 | .11032E-01 | .27831E-01 | .57841E+01 | .58272E+01 |
| .97412E-04 | .74595E-01 | .47774E-03 | .14136E-01 | .27836E-01 | .58562E+01 | .59300E+01 |
| .12336E-03 | .93772E-01 | .74516E-03 | .17341E-01 | .27858E-01 | .59277E+01 | .60441E+01 |
| .15170E-03 | .11444E+00 | .10929E-02 | .20596E-01 | .27859E-01 | .59968E+01 | .61699E+01 |
| .16727E-03 | .12560E+00 | .13051E-02 | .22280E-01 | .27869E-01 | .60309E+01 | .62395E+01 |
| .18385E-03 | .13684E+00 | .15349E-02 | .23891E-01 | .27872E-01 | .60625E+01 | .63095E+01 |
| .20081E-03 | .14906E+00 | .18031E-02 | .25587E-01 | .27881E-01 | .60943E+01 | .63871E+01 |
| .21718E-03 | .16126E+00 | .20882E-02 | .27200E-01 | .27885E-01 | .61232E+01 | .64653E+01 |
| .25510E-03 | .18772E+00 | .27696E-02 | .30476E-01 | .27907E-01 | .61765E+01 | .66395E+01 |
| .29782E-03 | .21662E+00 | .36022E-02 | .33662E-01 | .27907E-01 | .62198E+01 | .68351E+01 |
| .34333E-03 | .24809E+00 | .45941E-02 | .36682E-01 | .27927E-01 | .62495E+01 | .70548E+01 |
| .39443E-03 | .28230E+00 | .57750E-02 | .39443E-01 | .27923E-01 | .62615E+01 | .73019E+01 |
| .45872E-03 | .31945E+00 | .71449E-02 | .41836E-01 | .27938E-01 | .62507E+01 | .75799E+01 |
| .51260E-03 | .35967E+00 | .87365E-02 | .43741E-01 | .27926E-01 | .62114E+01 | .78927E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .58485E-03 | .40593E+00 | .10658E-01 | .35080E-01 | .27932E-01 | .61309E+01 | .82675E+01 |
| .66430E-03 | .45601E+00 | .12858E-01 | .45559E-01 | .27905E-01 | .60013E+01 | .86917E+01 |
| .75213E-03 | .51048E+00 | .15341E-01 | .45014E-01 | .27893E-01 | .58104E+01 | .91749E+01 |
| .84874E-03 | .56936E+00 | .18165E-01 | .43292E-01 | .27846E-01 | .55448E+01 | .97224E+01 |
| .95416E-03 | .63230E+00 | .21308E-01 | .40304E-01 | .27806E-01 | .51917E+01 | .10336E+02 |
| .10699E-02 | .69962E+00 | .24919E-01 | .35998E-01 | .27738E-01 | .47321E+01 | .11022E+02 |
| .11973E-02 | .77071E+00 | .29051E-01 | .30444E-01 | .27646E-01 | .41488E+01 | .11775E+02 |
| .13374E-02 | .84349E+00 | .33935E-01 | .23966E-01 | .27519E-01 | .34340E+01 | .12563E+02 |
| .14915E-02 | .91232E+00 | .39916E-01 | .17995E-01 | .27344E-01 | .26131E+01 | .13295E+02 |
| .16515E-02 | .96237E+00 | .44898E-01 | .12726E-01 | .27083E-01 | .18838E+01 | .13763E+02 |
| .18116E-02 | .98376E+00 | .47754E-01 | .11723E-01 | .26691E-01 | .14496E+01 | .13868E+02 |
| .19717E-02 | .98574E+00 | .48350E-01 | .14640E-01 | .26280E-01 | .13340E+01 | .13804E+02 |
| .21318E-02 | .98460E+00 | .48195E-01 | .19836E-01 | .25829E-01 | .13411E+01 | .13785E+02 |
| .22916E-02 | .98547E+00 | .43216E-01 | .25462E-01 | .25426E-01 | .13302E+01 | .13799E+02 |
| .24512E-02 | .98569E+00 | .48691E-01 | .31694E-01 | .25005E-01 | .13153E+01 | .13795E+02 |
| .26109E-02 | .98584E+00 | .49610E-01 | .38010E-01 | .24601E-01 | .13049E+01 | .13795E+02 |
| .27705E-02 | .98603E+00 | .50778E-01 | .44399E-01 | .24211E-01 | .12930E+01 | .13796E+02 |
| .29303E-02 | .98603E+00 | .52081E-01 | .50879E-01 | .23819E-01 | .12828E+01 | .13795E+02 |
| .30900E-02 | .98605E+00 | .53720E-01 | .57327E-01 | .23461E-01 | .12714E+01 | .13796E+02 |
| .32456E-02 | .98595E+00 | .55469E-01 | .63573E-01 | .23095E-01 | .12615E+01 | .13796E+02 |
| .33894E-02 | .98581E+00 | .57249E-01 | .69312E-01 | .22807E-01 | .12531E+01 | .13796E+02 |
| .35092E-02 | .98565E+00 | .58892E-01 | .74336E-01 | .22532E-01 | .12457E+01 | .13796E+02 |
| .36209E-02 | .98547E+00 | .60461E-01 | .78822E-01 | .22315E-01 | .12392E+01 | .13796E+02 |
| .37207E-02 | .98530E+00 | .61855E-01 | .82834E-01 | .22102E-01 | .12334E+01 | .13797E+02 |
| .38125E-02 | .98512E+00 | .63147E-01 | .86465E-01 | .21936E-01 | .12281E+01 | .13797E+02 |
| .38964E-02 | .98497E+00 | .64231E-01 | .89739E-01 | .21767E-01 | .12230E+01 | .13797E+02 |
| .39722E-02 | .98483E+00 | .65191E-01 | .92583E-01 | .21651E-01 | .12186E+01 | .13797E+02 |
| .40401E-02 | .98474E+00 | .65837E-01 | .94987E-01 | .21521E-01 | .12144E+01 | .13798E+02 |
| .41016E-02 | .98464E+00 | .66485E-01 | .96917E-01 | .21476E-01 | .12113E+01 | .13798E+02 |
| .41575E-02 | .98465E+00 | .66489E-01 | .98391E-01 | .21329E-01 | .12077E+01 | .13798E+02 |
| .42094E-02 | .98447E+00 | .67536E-01 | .99243E-01 | .21532E-01 | .12080E+01 | .13798E+02 |
| .42573E-02 | .98530E+00 | .62932E-01 | .99882E-01 | .20368E-01 | .11950E+01 | .13800E+02 |

AT FI = 160.00 CPINF = .71098E-02 STINF = .24842E-01 SHOCK DISTANCE = .43790E-02

| Y | U | V | W | P | M | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .26371E-01 | .55093E+01 | .55093E+01 |
| .16425E-04 | .12572E-01 | .14091E-04 | .17400E-02 | .26380E-01 | .55747E+01 | .55768E+01 |
| .34493E-04 | .26241E-01 | .63504E-04 | .35756E-02 | .26392E-01 | .56422E+01 | .56512E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .54203E-04 | .46977E-01 | .15184E-03 | .54877E-02 | .26400E-01 | .57110E+01 | .57329E+01 |
| .75966E-04 | .57049E-01 | .29241E-03 | .74335E-02 | .26416E-01 | .57812E+01 | .58236E+01 |
| .10020E-03 | .74713E-01 | .49448E-03 | .98015E-02 | .26421E-01 | .58525E+01 | .59251E+01 |
| .12686E-03 | .93919E-01 | .77154E-03 | .11778E-01 | .26443E-01 | .59233E+01 | .60380E+01 |
| .15604E-03 | .11462E+00 | .11320E-02 | .13988E-01 | .26444E-01 | .59917E+01 | .61624E+01 |
| .17205E-03 | .12587E+00 | .13532E-02 | .15132E-01 | .26453E-01 | .60294E+01 | .62311E+01 |
| .18807E-03 | .13705E+00 | .15906E-02 | .16226E-01 | .26456E-01 | .60566E+01 | .63004E+01 |
| .20572E-03 | .14928E+00 | .18690E-02 | .17377E-01 | .26465E-01 | .60881E+01 | .63773E+01 |
| .22338E-03 | .16143E+00 | .21652E-02 | .18472E-01 | .26468E-01 | .61185E+01 | .64545E+01 |
| .26239E-03 | .18798E+00 | .28734E-02 | .20696E-01 | .26490E-01 | .61691E+01 | .66270E+01 |
| .30551E-03 | .21690E+00 | .37402E-02 | .22858E-01 | .26488E-01 | .62115E+01 | .68206E+01 |
| .35314E-03 | .24838E+00 | .47744E-02 | .24906E-01 | .26500E-01 | .62402E+01 | .70381E+01 |
| .40571E-03 | .28259E+00 | .60086E-02 | .26778E-01 | .26500E-01 | .62511E+01 | .72829E+01 |
| .46360E-03 | .31971E+00 | .74439E-02 | .28600E-01 | .26514E-01 | .62391E+01 | .75585E+01 |
| .52725E-03 | .35989E+00 | .91173E-02 | .29888E-01 | .26498E-01 | .61985E+01 | .78687E+01 |
| .60157E-03 | .40608E+00 | .11146E-01 | .30591E-01 | .26501E-01 | .61165E+01 | .82408E+01 |
| .68329E-03 | .45604E+00 | .13482E-01 | .30908E-01 | .26468E-01 | .59856E+01 | .86622E+01 |
| .77353E-03 | .51036E+00 | .16134E-01 | .30529E-01 | .26451E-01 | .57939E+01 | .91427E+01 |
| .87300E-03 | .56905E+00 | .19173E-01 | .29349E-01 | .26397E-01 | .55272E+01 | .96878E+01 |
| .98143E-03 | .63176E+00 | .22580E-01 | .27310E-01 | .26351E-01 | .51743E+01 | .10299E+02 |
| .11004E-02 | .69880E+00 | .26522E-01 | .24377E-01 | .26268E-01 | .47181E+01 | .10984E+02 |
| .12315E-02 | .76974E+00 | .31054E-01 | .20309E-01 | .26178E-01 | .41355E+01 | .11737E+02 |
| .13756E-02 | .84248E+00 | .36422E-01 | .16192E-01 | .26042E-01 | .34244E+01 | .12530E+02 |
| .15342E-02 | .91161E+00 | .42545E-01 | .11704E-01 | .25897E-01 | .26106E+01 | .13273E+02 |
| .16987E-02 | .96238E+00 | .48483E-01 | .84724E-02 | .25581E-01 | .18692E+01 | .13755E+02 |
| .18634E-02 | .98444E+00 | .51734E-01 | .77477E-02 | .25163E-01 | .14295E+01 | .13869E+02 |
| .20281E-02 | .98608E+00 | .52493E-01 | .96194E-02 | .24718E-01 | .13082E+01 | .13806E+02 |
| .21928E-02 | .98558E+00 | .52397E-01 | .13103E-01 | .24241E-01 | .13133E+01 | .13785E+02 |
| .23571E-02 | .98661E+00 | .52465E-01 | .16964E-01 | .23612E-01 | .13015E+01 | .13800E+02 |
| .25213E-02 | .98699E+00 | .53196E-01 | .21167E-01 | .23367E-01 | .12849E+01 | .13796E+02 |
| .26855E-02 | .98729E+00 | .53967E-01 | .25626E-01 | .22939E-01 | .12734E+01 | .13796E+02 |
| .28497E-02 | .98765E+00 | .55197E-01 | .30066E-01 | .22525E-01 | .12604E+01 | .13797E+02 |
| .30140E-02 | .98706E+00 | .56574E-01 | .34587E-01 | .22105E-01 | .12486E+01 | .13796E+02 |
| .31783E-02 | .98845E+00 | .58289E-01 | .39091E-01 | .21719E-01 | .12372E+01 | .13796E+02 |
| .33384E-02 | .98827E+00 | .60128E-01 | .43536E-01 | .21321E-01 | .12267E+01 | .13796E+02 |
| .34922E-02 | .98823E+00 | .61976E-01 | .47405E-01 | .21000E-01 | .12177E+01 | .13796E+02 |
| .36695E-02 | .98826E+00 | .63696E-01 | .51008E-01 | .20692E-01 | .12099E+01 | .13796E+02 |
| .37244E-02 | .98826E+00 | .65314E-01 | .54151E-01 | .20441E-01 | .12030E+01 | .13796E+02 |
| .38271E-02 | .98826E+00 | .66752E-01 | .56963E-01 | .20196E-01 | .11967E+01 | .13796E+02 |
| .39215E-02 | .98825E+00 | .68059E-01 | .59508E-01 | .19994E-01 | .11910E+01 | .13797E+02 |
| .40078E-02 | .98826E+00 | .69160E-01 | .61831E-01 | .19792E-01 | .11855E+01 | .13797E+02 |
| .40857E-02 | .98827E+00 | .70092E-01 | .63795E-01 | .19639E-01 | .11869E+01 | .13797E+02 |
| .41555E-02 | .98831E+00 | .70739E-01 | .65478E-01 | .19484E-01 | .11758E+01 | .13797E+02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .42188E-02 | .98834E+00 | .71293E-01 | .66832E-01 | .19393E-01 | .11720E+01 | .13797E+02 |
| .42763E-02 | .98843E+00 | .71353E-01 | .67854E-01 | .19249E-01 | .11681[illegible] | .13798E+02 |
| .43297E-02 | .98836E+00 | .72088E-01 | .68461E-01 | .19346E-01 | .11672E+01 | .13797E+02 |
| .43790E-02 | .98952E+00 | .66156E-01 | .68938E-01 | .18005E-01 | .11501E+01 | .13800E+02 |

AT FI = 170.00 CFINF = .69975E-02 STIHF = .24085E-01 SHOCK DISTANCE = .44530E-02

| Y | U | V | H | P | M | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .25545E-01 | .55093E+01 | .55093E+01 |
| .16703E-04 | .12590E-01 | .14288E-04 | .87558E-03 | .25554E-01 | .55743E+01 | .55763E+01 |
| .35076E-04 | .26281E-01 | .64494E-04 | .17995E-02 | .25558E-01 | .56414E+01 | .56503E+01 |
| .55119E-04 | .41038E-01 | .15421E-03 | .27822E-02 | .25574E-01 | .57098E+01 | .57315E+01 |
| .77250E-04 | .57134E-01 | .29707E-03 | .37724E-02 | .25590E-01 | .57795E+01 | .58215E+01 |
| .10189E-03 | .74825E-01 | .50246E-03 | .48348E-02 | .25595E-01 | .58505E+01 | .59225E+01 |
| .12903E-03 | .94058E-01 | .78421E-03 | .59316E-02 | .25617E-01 | .59208E+01 | .60345E+01 |
| .15867E-03 | .11478E+00 | .11510E-02 | .70463E-02 | .25617E-01 | .59888E+01 | .61581E+01 |
| .17496E-03 | .12615E+00 | .13761E-02 | .76230E-02 | .25626E-01 | .60224E+01 | .62265E+01 |
| .19125E-03 | .13724E+00 | .16178E-02 | .81753E-02 | .25629E-01 | .60533E+01 | .62953E+01 |
| .20920E-03 | .14950E+00 | .19013E-02 | .87564E-02 | .25636E-01 | .60846E+01 | .63717E+01 |
| .22716E-03 | .16168E+00 | .22031E-02 | .93891E-02 | .25641E-01 | .61128E+01 | .64485E+01 |
| .26683E-03 | .18824E+00 | .29251E-02 | .10432E-01 | .25662E-01 | .61648E+01 | .66199E+01 |
| .31067E-03 | .21718E+00 | .38097E-02 | .11525E-01 | .25660E-01 | .62066E+01 | .68122E+01 |
| .35911E-03 | .24868E+00 | .48664E-02 | .12560E-01 | .25679E-01 | .62348E+01 | .70237E+01 |
| .41256E-03 | .28290E+00 | .61294E-02 | .13507E-01 | .25676E-01 | .62449E+01 | .72721E+01 |
| .47143E-03 | .32002E+00 | .76007E-02 | .14328E-01 | .25682E-01 | .62321E+01 | .75464E+01 |
| .53616E-03 | .36019E+00 | .93203E-02 | .14981E-01 | .25664E-01 | .61906E+01 | .78552E+01 |
| .61174E-03 | .40635E+00 | .11410E-01 | .15438E-01 | .25665E-01 | .61076E+01 | .82259E+01 |
| .69483E-03 | .45625E+00 | .13826E-01 | .15599E-01 | .25629E-01 | .59757E+01 | .86458E+01 |
| .78870E-03 | .51047E+00 | .16577E-01 | .15407E-01 | .25609E-01 | .57828E+01 | .91246E+01 |
| .88776E-03 | .56904E+00 | .19746E-01 | .14809E-01 | .25552E-01 | .55157E+01 | .96652E+01 |
| .99802E-03 | .63161E+00 | .23313E-01 | .13776E-01 | .25503E-01 | .51627E+01 | .10278E+02 |
| .11190E-02 | .69854E+00 | .27457E-01 | .12290E-01 | .25410E-01 | .47851E+01 | .10963E+02 |
| .12523E-02 | .76929E+00 | .32236E-01 | .10377E-01 | .25323E-01 | .41262E+01 | .11716E+02 |
| .13989E-02 | .84196E+00 | .37902E-01 | .81461E-02 | .25183E-01 | .34173E+01 | .12510E+02 |
| .15601E-02 | .91122E+00 | .44362E-01 | .58738E-02 | .24992E-01 | .26853E+01 | .13259E+02 |
| .17274E-02 | .96240E+00 | .50648E-01 | .42266E-02 | .24799E-01 | .18619E+01 | .13750E+02 |
| .18949E-02 | .98484E+00 | .54151E-01 | .38436E-02 | .24277E-01 | .14174E+01 | .13870E+02 |
| .21624E-02 | .98721E+00 | .55020E-01 | .47544E-02 | .23814E-01 | .12928E+01 | .13807E+02 |
| .22296E-02 | .98615E+00 | .54966E-01 | .65181E-02 | .23321E-01 | .12975E+01 | .13785E+02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .23969E-02 | .98729E+00 | .55064E-01 | .84711E-02 | .22878E-01 | .12843E+01 | .13601E+02 |
| .25639E-02 | .98775E+00 | .55828E-01 | .10620E-01 | .22421E-01 | .12667E+01 | .13796E+02 |
| .27309E-02 | .98819E+00 | .56627E-01 | .12990E-01 | .21979E-01 | .12549E+01 | .13796E+02 |
| .28979E-02 | .98863E+00 | .57809E-01 | .15166E-01 | .21551E-01 | .12409E+01 | .13797E+02 |
| .30650E-02 | .98895E+00 | .59304E-01 | .17490E-01 | .21116E-01 | .12286E+01 | .13796E+02 |
| .32320E-02 | .98928E+00 | .61355E-01 | .19808E-01 | .20703E-01 | .12168E+01 | .13797E+02 |
| .33948E-02 | .98954E+00 | .62939E-01 | .22100E-01 | .20296E-01 | .12059E+01 | .13796E+02 |
| .35410E-02 | .98974E+00 | .64821E-01 | .24136E-01 | .19955E-01 | .11966E+01 | .13797E+02 |
| .36705E-02 | .98989E+00 | .66572E-01 | .25994E-01 | .19628E-01 | .11885E+01 | .13796E+02 |
| .37873E-02 | .99002E+00 | .68207E-01 | .27575E-01 | .19355E-01 | .11813E+01 | .13796E+02 |
| .38917E-02 | .99014E+00 | .69658E-01 | .29026E-01 | .19088E-01 | .11747E+01 | .13796E+02 |
| .39878E-02 | .99025E+00 | .70958E-01 | .30338E-01 | .18863E-01 | .11686E+01 | .13796E+02 |
| .40755E-02 | .99037E+00 | .72050E-01 | .31520E-01 | .18640E-01 | .11628E+01 | .13797E+02 |
| .41548E-02 | .99049E+00 | .72946E-01 | .32548E-01 | .18451E-01 | .11574E+01 | .13797E+02 |
| .42258E-02 | .99062E+00 | .73972E-01 | .33415E-01 | .18289E-01 | .11524E+01 | .13797E+02 |
| .42901E-02 | .99073E+00 | .74050E-01 | .34113E-01 | .18169E-01 | .11481E+01 | .13797E+02 |
| .43486E-02 | .99088E+00 | .74143E-01 | .34636E-01 | .18027E-01 | .11440E+01 | .13797E+02 |
| .44029E-02 | .99092E+00 | .74514E-01 | .34955E-01 | .18028E-01 | .11418E+01 | .13797E+02 |
| .44530E-02 | .99234E+00 | .67481E-01 | .35211E-01 | .16555E-01 | .11213E+01 | .13800E+02 |

AT FI = 180.00 CFINF = .69625E-02 STINF = .23877E-01 SHOCK DISTANCE = .44779E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .25278E-01 | .55093E+01 | .55093E+01 |
| .16796E-04 | .12597E-01 | .14386E-04 | -.22785E-16 | .25288E-01 | .55741E+01 | .55761E+01 |
| .35272E-04 | .26295E-01 | .64953E-04 | -.47625E-16 | .25300E-01 | .56421E+01 | .56500E+01 |
| .55427E-04 | .41061E-01 | .15531E-03 | -.74483E-16 | .25307E-01 | .57094E+01 | .57310E+01 |
| .77682E-04 | .57165E-01 | .29919E-03 | -.10389E-15 | .25324E-01 | .57790E+01 | .58208E+01 |
| .10240E-03 | .74865E-01 | .50685E-03 | -.13636E-15 | .25320E-01 | .58498E+01 | .59215E+01 |
| .12975E-03 | .94109E-01 | .78983E-03 | -.17191E-15 | .25350E-01 | .59201E+01 | .60335E+01 |
| .15956E-03 | .11485E+00 | .11592E-02 | -.21056E-15 | .25350E-01 | .59879E+01 | .61568E+01 |
| .17594E-03 | .12612E+00 | .13860E-02 | -.23176E-15 | .25360E-01 | .60214E+01 | .62250E+01 |
| .19232E-03 | .13732E+00 | .16295E-02 | -.25297E-15 | .25362E-01 | .60523E+01 | .62937E+01 |
| .21037E-03 | .14957E+00 | .19151E-02 | -.27638E-15 | .25371E-01 | .60834E+01 | .63698E+01 |
| .22843E-03 | .16174E+00 | .22192E-02 | -.29986E-15 | .25374E-01 | .61116E+01 | .64465E+01 |
| .26832E-03 | .18833E+00 | .29466E-02 | -.35204E-15 | .25395E-01 | .61634E+01 | .66175E+01 |
| .31241E-03 | .21729E+00 | .38380E-02 | -.41065E-15 | .25392E-01 | .62051E+01 | .68096E+01 |
| .36112E-03 | .24879E+00 | .49030E-02 | -.47711E-15 | .25411E-01 | .62330E+01 | .70256E+01 |
| .41487E-03 | .28302E+00 | .61766E-02 | -.55341E-15 | .25401E-01 | .62429E+01 | .72687E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .47407E-03 | .32011E+00 | .76606E-02 | -.64233E-15 | .25413E-01 | .62298E+01 | .75424E+01 |
| .53916E-03 | .36031E+00 | .93962E-02 | -.74793E-15 | .25394E-01 | .61180E+01 | .78509E+01 |
| .61516E-03 | .40646E+00 | .11507E-01 | -.88501E-15 | .25394E-01 | .61047E+01 | .82211E+01 |
| .69872E-03 | .45634E+00 | .13949E-01 | -.10589E-14 | .25397E-01 | .59724E+01 | .86404E+01 |
| .79110E-03 | .51054E+00 | .16734E-01 | -.12896E-14 | .25337E-01 | .57790E+01 | .91189E+01 |
| .89272E-03 | .56907E+00 | .19944E-01 | -.15394E-14 | .25278E-01 | .55118E+01 | .96621E+01 |
| .10036E-02 | .63160E+00 | .23504E-01 | -.20733E-14 | .25228E-01 | .51587E+01 | .10272E+02 |
| .11253E-02 | .69848E+00 | .27775E-01 | -.27363E-14 | .25140E-01 | .47013E+01 | .10956E+02 |
| .12593E-02 | .76910E+00 | .32634E-01 | -.40190E-14 | .25045E-01 | .41228E+01 | .11709E+02 |
| .14057E-02 | .84180E+00 | .38399E-01 | -.63143E-14 | .24903E-01 | .34147E+01 | .12509E+02 |
| .15688E-02 | .91113E+00 | .44971E-01 | -.11218E-13 | .24711E-01 | .26031E+01 | .13255E+02 |
| .17371E-02 | .96242E+00 | .51374E-01 | -.22401E-13 | .24425E-01 | .18591E+01 | .13749E+02 |
| .19055E-02 | .98498E+00 | .54963E-01 | -.47129E-13 | .23989E-01 | .14132E+01 | .13870E+02 |
| .20739E-02 | .98738E+00 | .55869E-01 | -.96598E-13 | .23519E-01 | .12877E+01 | .13307E+02 |
| .22423E-02 | .98634E+00 | .55830E-01 | -.17284E-12 | .23022E-01 | .12922E+01 | .13785E+02 |
| .24103E-02 | .98751E+00 | .55940E-01 | -.25035E-12 | .22575E-01 | .12787E+01 | .13801E+02 |
| .25782E-02 | .98801E+00 | .56714E-01 | -.35706E-12 | .22113E-01 | .12607E+01 | .13797E+02 |
| .27462E-02 | .98844E+00 | .57521E-01 | -.46073E-12 | .21667E-01 | .12482E+01 | .13796E+02 |
| .29141E-02 | .98895E+00 | .58793E-01 | -.56976E-12 | .21234E-01 | .12344E+01 | .13797E+02 |
| .30821E-02 | .98932E+00 | .60218E-01 | -.66714E-12 | .20794E-01 | .12219E+01 | .13796E+02 |
| .32501E-02 | .98970E+00 | .61979E-01 | -.81307E-12 | .20385E-01 | .12108E+01 | .13797E+02 |
| .34138E-02 | .99000E+00 | .63873E-01 | -.94721E-12 | .19961E-01 | .11989E+01 | .13796E+02 |
| .35608E-02 | .99025E+00 | .65764E-01 | -.10770E-11 | .19614E-01 | .11895E+01 | .13796E+02 |
| .36910E-02 | .99045E+00 | .67522E-01 | -.12019E-11 | .19279E-01 | .11813E+01 | .13796E+02 |
| .38085E-02 | .99063E+00 | .69159E-01 | -.13223E-11 | .18998E-01 | .11740E+01 | .13796E+02 |
| .39135E-02 | .99079E+00 | .70608E-01 | -.14376E-11 | .18724E-01 | .11674E+01 | .13797E+02 |
| .40101E-02 | .99094E+00 | .71899E-01 | -.15497E-11 | .18489E-01 | .11611E+01 | .13796E+02 |
| .40983E-02 | .99110E+00 | .72982E-01 | -.16578E-11 | .18298E-01 | .11552E+01 | .13797E+02 |
| .41780E-02 | .99126E+00 | .73860E-01 | -.17592E-11 | .18079E-01 | .11497E+01 | .13797E+02 |
| .42494E-02 | .99142E+00 | .74472E-01 | -.18523E-11 | .17891E-01 | .11445E+01 | .13797E+02 |
| .43141E-02 | .99157E+00 | .74919E-01 | -.19353E-11 | .17761E-01 | .11400E+01 | .13797E+02 |
| .43729E-02 | .99173E+00 | .75022E-01 | -.20103E-11 | .17620E-01 | .11357E+01 | .13797E+02 |
| .44275E-02 | .99182E+00 | .75226E-01 | -.20729E-11 | .17582E-01 | .11330E+01 | .13797E+02 |
| .44779E-02 | .99334E+00 | .67790E-01 | -.21221E-11 | .16059E-01 | .11111E+01 | .13800E+02 |

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ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0
ITER,INS  1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
ITER,INS  1 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0
ITER,INS  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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SOLUTION AT X = .41000E-01

AT FI = 0.00 CFINF = .23267E-01 STINF = .10214E+00 SHOCK DISTANCE = .18304E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .14400E+00 | .55093E+01 | .55093E+01 |
| .68656E-05 | .17208E-01 | -.86531E-05 | -.54635E-68 | .14398E+00 | .56226E+01 | .56264E+01 |
| .14418E-04 | .35824E-01 | -.37749E-04 | -.11353E-67 | .14397E+00 | .57388E+01 | .57552E+01 |
| .22657E-04 | .55795E-01 | -.92153E-04 | -.17612E-67 | .14395E+00 | .58560E+01 | .58959E+01 |
| .31754E-04 | .77483E-01 | -.17950E-03 | -.24294E-67 | .14393E+00 | .59746E+01 | .60515E+01 |
| .41862E-04 | .10123E+00 | -.30918E-03 | -.31414E-67 | .14391E+00 | .60941E+01 | .62252E+01 |
| .53037E-04 | .12694E+00 | -.49085E-03 | -.38820E-67 | .14388E+00 | .62112E+01 | .64174E+01 |
| .65222E-04 | .15456E+00 | -.73339E-03 | -.46329E-67 | .14386E+00 | .63228E+01 | .66286E+01 |
| .71918E-04 | .16955E+00 | -.88589E-03 | -.50173E-67 | .14384E+00 | .63773E+01 | .67453E+01 |
| .78613E-04 | .18442E+00 | -.10515E-02 | -.53817E-67 | .14383E+00 | .64270E+01 | .68624E+01 |
| .85992E-04 | .20067E+00 | -.12483E-02 | -.57559E-67 | .14381E+00 | .64765E+01 | .69919E+01 |
| .93374E-04 | .21680E+00 | -.14615E-02 | -.61039E-67 | .14380E+00 | .65205E+01 | .71222E+01 |
| .10968E-03 | .25198E+00 | -.19823E-02 | -.67722E-67 | .14376E+00 | .65988E+01 | .74116E+01 |
| .12770E-03 | .29020E+00 | -.26347E-02 | -.73412E-67 | .14373E+00 | .66565E+01 | .77346E+01 |
| .14761E-03 | .33170E+00 | -.34389E-02 | -.77544E-67 | .14368E+00 | .66838E+01 | .80951E+01 |
| .16958E-03 | .37666E+00 | -.44183E-02 | -.79430E-67 | .14365E+00 | .66807E+01 | .84976E+01 |
| .19378E-03 | .42519E+00 | -.55857E-02 | -.78283E-67 | .14360E+00 | .66289E+01 | .89433E+01 |
| .22039E-03 | .47733E+00 | -.69579E-02 | -.73280E-67 | .14357E+00 | .65197E+01 | .94367E+01 |
| .25146E-03 | .53650E+00 | -.86289E-02 | -.62923E-67 | .14352E+00 | .63271E+01 | .10812E+02 |
| .28561E-03 | .59917E+00 | -.10504E-01 | -.46910E-67 | .14349E+00 | .60412E+01 | .10638E+02 |
| .18304E-02 | .92437E+00 | -.90525E-01 | 0. | .11963E+00 | .27439E+01 | .13800E+02 |

AT FI = 120.00 CFINF = .82668E-02 STINF = .31112E-01 SHOCK DISTANCE = .37895E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .30999E-01 | .55093E+01 | .55093E+01 |
| .14214E-04 | .12658E-01 | .10415E-04 | .48339E-02 | .36007E-01 | .55800E+01 | .55831E+01 |
| .29849E-04 | .26415E-01 | .45713E-04 | .10053E-01 | .36016E-01 | .56544E+01 | .56647E+01 |
| .46906E-04 | .41239E-01 | .10965E-03 | .15425E-01 | .36024E-01 | .57292E+01 | .57540E+01 |
| .65739E-04 | .57404E-01 | .21102E-03 | .21058E-01 | .36036E-01 | .58055E+01 | .58533E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .86708E-04 | .75172E-01 | .35727E-03 | .26975E-01 | .36043E-01 | .58829E+01 | .59645E+01 |
| .10980E-03 | .94487E-01 | .55802E-03 | .33081E-01 | .36060E-01 | .59596E+01 | .60879E+01 |
| .13503E-03 | .11531E+00 | .81942E-03 | .39279E-01 | .36067E-01 | .60338E+01 | .62236E+01 |
| .14889E-03 | .12664E+00 | .98028E-03 | .42486E-01 | .36076E-01 | .60706E+01 | .62990E+01 |
| .16275E-03 | .13790E+00 | .11527E-02 | .45555E-01 | .36081E-01 | .61046E+01 | .63746E+01 |
| .17803E-03 | .15023E+00 | .13552E-02 | .48781E-01 | .36091E-01 | .61390E+01 | .64583E+01 |
| .19331E-03 | .16248E+00 | .15706E-02 | .51350E-01 | .36097E-01 | .61702E+01 | .65425E+01 |
| .22707E-03 | .18927E+00 | .20862E-02 | .58081E-01 | .36120E-01 | .62283E+01 | .67301E+01 |
| .26438E-03 | .21851E+00 | .27152E-02 | .64138E-01 | .36132E-01 | .62763E+01 | .69402E+01 |
| .30560E-03 | .25040E+00 | .34654E-02 | .69875E-01 | .36160E-01 | .63104E+01 | .71756E+01 |
| .35109E-03 | .28516E+00 | .43534E-02 | .75117E-01 | .36175E-01 | .63264E+01 | .74397E+01 |
| .40119E-03 | .32299E+00 | .53779E-02 | .79656E-01 | .36207E-01 | .63190E+01 | .77359E+01 |
| .45627E-03 | .36407E+00 | .65532E-02 | .83263E-01 | .36223E-01 | .62822E+01 | .80681E+01 |
| .52059E-03 | .41146E+00 | .79471E-02 | .85788E-01 | .36258E-01 | .62026E+01 | .84646E+01 |
| .59130E-03 | .46289E+00 | .95001E-02 | .86571E-01 | .36273E-01 | .60713E+01 | .89112E+01 |
| .37895E-02 | .96875E+00 | .38157E-01 | .16512E+00 | .33153E-01 | .14157E+01 | .13800E+02 |

AT FI = 130.00 CFINF = .76560E-02 STINF = .28245E-01 SHOCK DISTANCE = .40315E-02

| Y | U | V | W | P | M | M TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .32260E+01 | .55093E+01 | .55093E+01 |
| .15121E-04 | .12471E-01 | .11338E-04 | .42627E-02 | .32268E-01 | .55783E+01 | .55805E+01 |
| .31755E-04 | .26028E-01 | .49887E-04 | .87588E-02 | .32277E-01 | .56496E+01 | .56592E+01 |
| .49901E-04 | .40639E-01 | .12009E-03 | .13442E-01 | .32285E-01 | .57220E+01 | .57455E+01 |
| .69937E-04 | .56573E-01 | .23171E-03 | .18354E-01 | .32298E-01 | .57960E+01 | .58412E+01 |
| .92245E-04 | .74890E-01 | .39362E-03 | .23518E-01 | .32305E-01 | .58712E+01 | .59485E+01 |
| .11681E-03 | .93134E-01 | .61689E-03 | .28848E-01 | .32322E-01 | .59458E+01 | .60675E+01 |
| .14365E-03 | .11367E+00 | .96937E-03 | .34262E-01 | .32330E-01 | .60182E+01 | .61986E+01 |
| .15540E-03 | .12484E+00 | .10903E-02 | .37063E-01 | .32339E-01 | .60541E+01 | .62712E+01 |
| .17315E-03 | .13594E+00 | .12847E-02 | .39746E-01 | .32344E-01 | .60873E+01 | .63441E+01 |
| .18940E-03 | .14809E+00 | .15137E-02 | .42566E-01 | .32354E-01 | .61209E+01 | .64248E+01 |
| .20566E-03 | .16018E+00 | .17581E-02 | .45250E-01 | .32359E-01 | .61515E+01 | .65061E+01 |
| .24157E-03 | .18868E+00 | .23465E-02 | .50701E-01 | .32384E-01 | .62085E+01 | .66872E+01 |
| .28126E-03 | .21943E+00 | .30702E-02 | .56005E-01 | .32394E-01 | .62557E+01 | .68900E+01 |
| .32512E-03 | .24688E+00 | .39402E-02 | .61033E-01 | .32422E-01 | .62695E+01 | .71175E+01 |
| .37351E-03 | .28118E+00 | .49812E-02 | .65834E-01 | .32433E-01 | .63057E+01 | .73730E+01 |
| .42681E-03 | .31846E+00 | .61951E-02 | .69627E-01 | .32464E-01 | .62992E+01 | .76599E+01 |
| .48541E-03 | .35899E+00 | .76053E-02 | .72811E-01 | .32474E-01 | .62639E+01 | .79821E+01 |
| .55383E-03 | .40974E+00 | .93027E-02 | .75060E-01 | .32505E-01 | .61871E+01 | .83575E+01 |
| .62906E-03 | .45651E+00 | .11226E-01 | .75802E-01 | .32511E-01 | .60599E+01 | .88027E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .40315E-02 | .97452E+00 | .49161E-01 | .14895E+00 | .27963E-01 | .13292E+01 | .13[illegible]E+02 |

AT FI = 140.00 CFINF = .72078E-02 STINF = .26122E-01 SHOCK DISTANCE = .42467E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .29425E-01 | .55893E+01 | .55893E+01 |
| .15929E-04 | .12367E-01 | .11888E-04 | .35345E-02 | .29434E-01 | .55765E+01 | .55786E+01 |
| .33450E-04 | .25814E-01 | .52671E-04 | .72636E-02 | .29443E-01 | .56468E+01 | .56592E+01 |
| .52565E-04 | .40307E-01 | .12695E-03 | .11148E-01 | .29451E-01 | .57168E+01 | .57392E+01 |
| .73670E-04 | .56115E-01 | .24578E-03 | .15225E-01 | .29464E-01 | .57891E+01 | .58323E+01 |
| .97169E-04 | .73493E-01 | .41850E-03 | .19510E-01 | .29471E-01 | .58627E+01 | .59387E+01 |
| .12305E-03 | .92386E-01 | .65788E-03 | .23935E-01 | .29489E-01 | .59359E+01 | .60525E+01 |
| .15132E-03 | .11276E+00 | .97245E-03 | .28430E-01 | .29495E-01 | .60069E+01 | .61800E+01 |
| .16685E-03 | .12384E+00 | .11670E-02 | .33757E-01 | .29504E-01 | .60422E+01 | .62506E+01 |
| .18239E-03 | .13486E+00 | .13783E-02 | .32984E-01 | .29509E-01 | .60748E+01 | .63215E+01 |
| .19951E-03 | .14691E+00 | .16269E-02 | .35327E-01 | .29519E-01 | .61079E+01 | .64001E+01 |
| .21663E-03 | .15890E+00 | .18929E-02 | .37556E-01 | .29525E-01 | .61379E+01 | .64792E+01 |
| .25446E-03 | .18511E+00 | .25361E-02 | .42085E-01 | .29549E-01 | .61941E+01 | .66554E+01 |
| .29628E-03 | .21378E+00 | .33314E-02 | .46491E-01 | .29557E-01 | .62406E+01 | .68530E+01 |
| .34247E-03 | .24490E+00 | .42940E-02 | .53571E-01 | .29585E-01 | .62739E+01 | .70747E+01 |
| .39345E-03 | .27889E+00 | .54538E-02 | .54495E-01 | .29592E-01 | .62899E+01 | .73239E+01 |
| .44959E-03 | .31580E+00 | .68165E-02 | .57817E-01 | .29621E-01 | .62834E+01 | .76040E+01 |
| .51132E-03 | .35607E+00 | .84134E-02 | .60488E-01 | .29626E-01 | .62485E+01 | .79191E+01 |
| .58339E-03 | .40243E+00 | .10353E-01 | .62345E-01 | .29652E-01 | .61725E+01 | .82966E+01 |
| .66264E-03 | .45278E+00 | .12576E-01 | .63338E-01 | .29650E-01 | .60460E+01 | .87239E+01 |
| .42467E-02 | .98013E+00 | .57576E-01 | .12662E+00 | .23735E-01 | .12560E+01 | .13800E+02 |

AT FI = 150.00 CFINF = .68942E-02 STINF = .24618E-01 SHOCK DISTANCE = .44239E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .27352E-01 | .55893E+01 | .55893E+01 |
| .16593E-04 | .12323E-01 | .12131E-04 | .27249E-02 | .27360E-01 | .55753E+01 | .55773E+01 |
| .34847E-04 | .25722E-01 | .54282E-04 | .56001E-02 | .27370E-01 | .56436E+01 | .56525E+01 |
| .54759E-04 | .40165E-01 | .13185E-03 | .85959E-02 | .27377E-01 | .57132E+01 | .57348E+01 |
| .76745E-04 | .55919E-01 | .25432E-03 | .11740E-01 | .27391E-01 | .57844E+01 | .58262E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .10122E-03 | .73237E-01 | .43383E-03 | .15045E-01 | .27397E-01 | .58570E+01 | .59285E+01 |
| .12819E-03 | .92066E-01 | .68367E-03 | .18458E-01 | .27416E-01 | .59292E+01 | .60420E+01 |
| .15764E-03 | .11237E+00 | .10130E-02 | .21925E-01 | .27420E-01 | .59993E+01 | .61671E+01 |
| .17382E-03 | .12341E+00 | .12180E-02 | .23720E-01 | .27430E-01 | .60341E+01 | .62363E+01 |
| .19000E-03 | .13439E+00 | .14394E-02 | .25438E-01 | .27434E-01 | .60664E+01 | .63058E+01 |
| .20783E-03 | .14648E+00 | .17012E-02 | .27245E-01 | .27444E-01 | .60990E+01 | .63829E+01 |
| .22568E-03 | .15834E+00 | .19821E-02 | .28965E-01 | .27449E-01 | .61288E+01 | .64605E+01 |
| .26508E-03 | .18445E+00 | .26627E-02 | .32458E-01 | .27474E-01 | .61843E+01 | .66333E+01 |
| .30864E-03 | .21294E+00 | .35090E-02 | .35857E-01 | .27480E-01 | .62302E+01 | .68272E+01 |
| .35677E-03 | .24401E+00 | .45374E-02 | .39080E-01 | .27507E-01 | .62630E+01 | .70449E+01 |
| .40987E-03 | .27707E+00 | .57837E-02 | .42029E-01 | .27511E-01 | .62784E+01 | .72898E+01 |
| .46835E-03 | .31470E+00 | .72551E-02 | .44589E-01 | .27538E-01 | .62715E+01 | .75653E+01 |
| .53266E-03 | .35471E+00 | .89912E-02 | .46632E-01 | .27539E-01 | .62363E+01 | .78756E+01 |
| .60774E-03 | .40085E+00 | .11113E-01 | .48076E-01 | .27562E-01 | .61600E+01 | .82479E+01 |
| .69029E-03 | .45095E+00 | .13564E-01 | .48607E-01 | .27552E-01 | .60342E+01 | .86698E+01 |
| .44239E-02 | .98528E+00 | .63152E-01 | .93665E-01 | .20417E-01 | .11960E+01 | .13800E+02 |

AT FI = 160.00 CFINF = .66899E-02 STINF = .23627E-01 SHOCK DISTANCE = .45553E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .25936E-01 | .55093E+01 | .55093E+01 |
| .17086E-04 | .12313E-01 | .12367E-04 | .18526E-02 | .25944E-01 | .55745E+01 | .55765E+01 |
| .35882E-04 | .25702E-01 | .55236E-04 | .38376E-02 | .25953E-01 | .56421E+01 | .56507E+01 |
| .56385E-04 | .40134E-01 | .13353E-03 | .58445E-02 | .25961E-01 | .57110E+01 | .57320E+01 |
| .79025E-04 | .55875E-01 | .25942E-03 | .79821E-02 | .25974E-01 | .57815E+01 | .58222E+01 |
| .10423E-03 | .73181E-01 | .44328E-03 | .10230E-01 | .25981E-01 | .58534E+01 | .59233E+01 |
| .13199E-03 | .91994E-01 | .69941E-03 | .12550E-01 | .25999E-01 | .59250E+01 | .60353E+01 |
| .16232E-03 | .11228E+00 | .10384E-02 | .14908E-01 | .26004E-01 | .59945E+01 | .61588E+01 |
| .17898E-03 | .12331E+00 | .12495E-02 | .15128E-01 | .26013E-01 | .60291E+01 | .62271E+01 |
| .19565E-03 | .13428E+00 | .14778E-02 | .17296E-01 | .26017E-01 | .60611E+01 | .62957E+01 |
| .21401E-03 | .14628E+00 | .17483E-02 | .18524E-01 | .26027E-01 | .60935E+01 | .63718E+01 |
| .23238E-03 | .15821E+00 | .20388E-02 | .19893E-01 | .26032E-01 | .61230E+01 | .64484E+01 |
| .27296E-03 | .18429E+00 | .27440E-02 | .22366E-01 | .26057E-01 | .61781E+01 | .66191E+01 |
| .31781E-03 | .21275E+00 | .36232E-02 | .24376E-01 | .26066E-01 | .62235E+01 | .68187E+01 |
| .36736E-03 | .24378E+00 | .46938E-02 | .26565E-01 | .26088E-01 | .62559E+01 | .70258E+01 |
| .42204E-03 | .27758E+00 | .59996E-02 | .28557E-01 | .26089E-01 | .62708E+01 | .72680E+01 |
| .48227E-03 | .31434E+00 | .75445E-02 | .30303E-01 | .26115E-01 | .62633E+01 | .75406E+01 |
| .54848E-03 | .35427E+00 | .93794E-02 | .31687E-01 | .26111E-01 | .62274E+01 | .78479E+01 |
| .62580E-03 | .40031E+00 | .11622E-01 | .32663E-01 | .26132E-01 | .61504E+01 | .82169E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .71080E-03 | .45029E+00 | .14233E-01 | .33017E-01 | .26115E-01 | .60238E+01 | .86357E+01 |
| .45553E-02 | .98953E+00 | .66152E-01 | .68836E-01 | .18005E-01 | .11501E+01 | .13800E+02 |

AT FI = 170.00 CFINF = .85799E-02 SFINF = .23868E-01 SHOCK DISTANCE = .46351E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .25111E-01 | .55093E+01 | .55093E+01 |
| .17385E-04 | .12309E-01 | .12338E-04 | .93112E-03 | .25118E-01 | .55741E+01 | .55761E+01 |
| .36510E-04 | .25706E-01 | .55568E-04 | .19139E-02 | .25128E-01 | .56412E+01 | .56497E+01 |
| .57372E-04 | .40141E-01 | .13438E-03 | .29383E-02 | .25135E-01 | .57097E+01 | .57305E+01 |
| .80408E-04 | .55808E-01 | .26145E-03 | .42137E-02 | .25145E-01 | .57798E+01 | .58200E+01 |
| .10606E-03 | .73194E-01 | .44702E-03 | .51447E-02 | .25154E-01 | .58514E+01 | .59203E+01 |
| .13430E-03 | .92010E-01 | .70628E-03 | .63130E-02 | .25173E-01 | .59227E+01 | .60316E+01 |
| .16516E-03 | .11230E+00 | .10493E-02 | .75005E-02 | .25177E-01 | .59920E+01 | .61541E+01 |
| .18211E-03 | .12333E+00 | .12633E-02 | .81153E-02 | .25186E-01 | .60264E+01 | .62219E+01 |
| .19907E-03 | .13430E+00 | .14949E-02 | .87040E-02 | .25190E-01 | .60582E+01 | .62901E+01 |
| .21779E-03 | .14630E+00 | .17695E-02 | .93233E-02 | .25200E-01 | .60905E+01 | .63630E+01 |
| .23645E-03 | .15823E+00 | .20549E-02 | .99127E-02 | .25204E-01 | .61199E+01 | .64417E+01 |
| .27774E-03 | .18431E+00 | .27820E-02 | .11110E-01 | .25230E-01 | .61747E+01 | .66112E+01 |
| .32337E-03 | .21275E+00 | .36799E-02 | .12278E-01 | .25232E-01 | .62198E+01 | .68014E+01 |
| .37379E-03 | .24378E+00 | .47747E-02 | .13382E-01 | .25259E-01 | .62519E+01 | .70151E+01 |
| .42943E-03 | .27757E+00 | .61102E-02 | .14394E-01 | .25259E-01 | .62665E+01 | .72558E+01 |
| .49071E-03 | .31431E+00 | .76554E-02 | .15274E-01 | .25284E-01 | .62589E+01 | .75268E+01 |
| .55808E-03 | .35420E+00 | .95786E-02 | .15975E-01 | .25278E-01 | .62221E+01 | .78324E+01 |
| .63675E-03 | .40019E+00 | .11897E-01 | .16471E-01 | .25296E-01 | .61444E+01 | .81996E+01 |
| .72324E-03 | .45010E+00 | .14598E-01 | .16653E-01 | .25277E-01 | .60171E+01 | .86108E+01 |
| .81686E-03 | .50454E+00 | .17673E-01 | .16459E-01 | .25274E-01 | .58277E+01 | .90935E+01 |
| .92405E-03 | .56355E+00 | .21188E-01 | .15831E-01 | .25230E-01 | .55626E+01 | .96367E+01 |
| .10388E-02 | .62683E+00 | .25077E-01 | .14732E-01 | .25187E-01 | .52886E+01 | .102495E+02 |
| .11648E-02 | .69467E+00 | .29490E-01 | .13142E-01 | .25101E-01 | .47470E+01 | .10937E+02 |
| .13035E-02 | .76664E+00 | .34451E-01 | .11083E-01 | .24992E-01 | .41591E+01 | .11699E+02 |
| .14561E-02 | .84070E+00 | .40190E-01 | .85704E-02 | .24827E-01 | .34362E+01 | .12585E+02 |
| .16239E-02 | .91137E+00 | .46631E-01 | .62075E-02 | .24592E-01 | .26052E+01 | .13265E+02 |
| .17981E-02 | .96327E+00 | .52842E-01 | .44360E-02 | .24262E-01 | .18466E+01 | .13759E+02 |
| .19724E-02 | .98523E+00 | .56139E-01 | .40819E-02 | .23777E-01 | .14045E+01 | .13870E+02 |
| .21467E-02 | .98704E+00 | .56847E-01 | .51028E-02 | .23284E-01 | .12904E+01 | .13603E+02 |
| .23210E-02 | .98607E+00 | .56759E-01 | .69811E-02 | .22773E-01 | .12975E+01 | .13785E+02 |
| .24949E-02 | .98728E+00 | .56918E-01 | .91199E-02 | .22324E-01 | .12823E+01 | .13801E+02 |
| .26687E-02 | .98768E+00 | .57772E-01 | .11250E-01 | .21856E-01 | .12650E+01 | .13796E+02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .28426E-02 | .98809E+00 | .58650E-01 | .13634E-01 | .21414E-01 | .12528E+01 | .13796E+02 |
| .30164E-02 | .98855E+00 | .60039E-01 | .15352E-01 | .20980E-01 | .12392E+01 | .13797E+02 |
| .31903E-02 | .98885E+00 | .61558E-01 | .18349E-01 | .20549E-01 | .12270E+01 | .13796E+02 |
| .33642E-02 | .98917E+00 | .63444E-01 | .20742E-01 | .20146E-01 | .12152E+01 | .13796E+02 |
| .35336E-02 | .98941E+00 | .65421E-01 | .23107E-01 | .19740E-01 | .12043E+01 | .13796E+02 |
| .36858E-02 | .98960E+00 | .67373E-01 | .25210E-01 | .19413E-01 | .11950E+01 | .13796E+02 |
| .38205E-02 | .98975E+00 | .69120E-01 | .27088E-01 | .19110E-01 | .11866E+01 | .13796E+02 |
| .39422E-02 | .98989E+00 | .70704E-01 | .28759E-01 | .18870E-01 | .11791E+01 | .13796E+02 |
| .40508E-02 | .99003E+00 | .72008E-01 | .30244E-01 | .18648E-01 | .11720E+01 | .13796E+02 |
| .41508E-02 | .99018E+00 | .73081E-01 | .31560E-01 | .18478E-01 | .11654E+01 | .13796E+02 |
| .42421E-02 | .99034E+00 | .73863E-01 | .32599E-01 | .18320E-01 | .11591E+01 | .13797E+02 |
| .43246E-02 | .99050E+00 | .74390E-01 | .33617E-01 | .18212E-01 | .11535E+01 | .13797E+02 |
| .43985E-02 | .99066E+00 | .74622E-01 | .34303E-01 | .18110E-01 | .11486E+01 | .13797E+02 |
| .44655E-02 | .99078E+00 | .74717E-01 | .34758E-01 | .18054E-01 | .11449E+01 | .13797E+02 |
| .45264E-02 | .99090E+00 | .74479E-01 | .35004E-01 | .17967E-01 | .11417E+01 | .13797E+02 |
| .45829E-02 | .99094E+00 | .74640E-01 | .35064E-01 | .18012E-01 | .11407E+01 | .13797E+02 |
| .46351E-02 | .99239E+00 | .67251E-01 | .35178E-01 | .16515E-01 | .11204E+01 | .13808E+02 |

AT FI = 180.00 CFINF = .65380E-02 STINF = .22883E-01 SHOCK DISTANCE = .46618E+02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .24849E-01 | .55093E+01 | .55093E+01 |
| .17481E-04 | .12315E-01 | .12468E-04 | -.20917E-16 | .24858E-01 | .55740E+01 | .55759E+01 |
| .36721E-04 | .25745E-01 | .56114E-04 | -.49991E-16 | .24866E-01 | .56409E+01 | .56494E+01 |
| .57703E-04 | .40140E-01 | .13569E-03 | -.78182E-16 | .24873E-01 | .57093E+01 | .57299E+01 |
| .80872E-04 | .55884E-01 | .26395E-03 | -.11504E-15 | .24886E-01 | .57793E+01 | .58193E+01 |
| .10667E-03 | .73191E-01 | .45137E-03 | -.14313E-15 | .24892E-01 | .58508E+01 | .59193E+01 |
| .13508E-03 | .92007E-01 | .71290E-03 | -.16043E-15 | .24911E-01 | .59219E+01 | .60303E+01 |
| .15611E-03 | .11229E+00 | .10594E-02 | -.22398E-15 | .24915E-01 | .59911E+01 | .61525E+01 |
| .18317E-03 | .12333E+00 | .12755E-02 | -.24323E-15 | .24924E-01 | .60254E+01 | .62201E+01 |
| .20022E-03 | .13429E+00 | .15094E-02 | -.25548E-15 | .24928E-01 | .60573E+01 | .62881E+01 |
| .21901E-03 | .14629E+00 | .17867E-02 | -.29033E-15 | .24938E-01 | .60895E+01 | .63635E+01 |
| .23781E-03 | .15822E+00 | .20846E-02 | -.31465E-15 | .24942E-01 | .61180E+01 | .64393E+01 |
| .27934E-03 | .18430E+00 | .28891E-02 | -.36936E-15 | .24967E-01 | .61735E+01 | .66084E+01 |
| .32524E-03 | .21275E+00 | .37149E-02 | -.43021E-15 | .24969E-01 | .62186E+01 | .67982E+01 |
| .37595E-03 | .24376E+00 | .48212E-02 | -.50349E-15 | .24995E-01 | .62506E+01 | .70115E+01 |
| .43191E-03 | .27755E+00 | .61695E-02 | -.58048E-15 | .24995E-01 | .62651E+01 | .72516E+01 |
| .49354E-03 | .31428E+00 | .77708E-02 | -.67372E-15 | .25019E-01 | .62570E+01 | .75221E+01 |
| .56130E-03 | .35416E+00 | .96735E-02 | -.78454E-15 | .25013E-01 | .62284E+01 | .78271E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .64042E-03 | .40614E+00 | .12016E-01 | -.92550E-15 | .25030E-01 | .61425E+01 | .61979E+01 |
| .72741E-03 | .45003E+00 | .14747E-01 | -.11113E-14 | .25009E-01 | .60150E+01 | .60[illegible]2E+01 |
| .46018E-02 | .99341E+00 | .67433E-01 | -.71[illegible]9E-15 | .16004E-01 | .11100E+01 | .12[illegible]0E+02 |

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ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ITER,INS  1 0 0 0 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
ITER,INS  1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
ITER,INS  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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SOLUTION AT X = .50000E-01

AT FI = 0.00 CFINF = .23336E-01 STINF = .10234E+00 SHOCK DISTANCE = .20825E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .17503E+00 | .55093E+01 | .55093E+01 |
| .78111E-05 | .19635E-01 | -.45202E-05 | .14706E-68 | .17503E+00 | .56385E+01 | .56434E+01 |
| .16404E-04 | .40828E-01 | -.19564E-04 | .30574E-68 | .17502E+00 | .57696E+01 | .57989E+01 |
| .25777E-04 | .63517E-01 | -.47697E-04 | .47709E-68 | .17501E+00 | .59085E+01 | .59521E+01 |
| .36127E-04 | .88108E-01 | -.92515E-04 | .65718E-68 | .17501E+00 | .60312E+01 | .61306E+01 |
| .47650E-04 | .11497E+00 | -.15862E-03 | .85309E-68 | .17500E+00 | .61608E+01 | .63300E+01 |
| .60341E-04 | .14404E+00 | -.25007E-03 | .10592E-67 | .17499E+00 | .62854E+01 | .65510E+01 |
| .74205E-04 | .17521E+00 | -.37064E-03 | .12786E-67 | .17498E+00 | .64011E+01 | .67940E+01 |
| .81823E-04 | .19211E+00 | -.44532E-03 | .13797E-67 | .17497E+00 | .64580E+01 | .69283E+01 |
| .89440E-04 | .20887E+00 | -.52560E-03 | .14934E-67 | .17497E+00 | .65051E+01 | .70635E+01 |
| .97835E-04 | .22716E+00 | -.62013E-03 | .15910E-67 | .17496E+00 | .65526E+01 | .72131E+01 |
| .10623E-03 | .24531E+00 | -.72061E-03 | .16912E-67 | .17496E+00 | .65932E+01 | .73635E+01 |
| .12478E-03 | .28484E+00 | -.96112E-03 | .18847E-67 | .17495E+00 | .66596E+01 | .76981E+01 |
| .14529E-03 | .32772E+00 | -.12508E-02 | .20504E-67 | .17494E+00 | .66973E+01 | .80720E+01 |
| .16794E-03 | .37416E+00 | -.15311E-02 | .21728E-67 | .17493E+00 | .66975E+01 | .84095E+01 |
| .19294E-03 | .42430E+00 | -.19785E-02 | .22357E-67 | .17492E+00 | .66495E+01 | .89543E+01 |
| .22047E-03 | .47815E+00 | -.24025E-02 | .22265E-67 | .17492E+00 | .65426E+01 | .94691E+01 |
| .25074E-03 | .53559E+00 | -.28425E-02 | .21419E-67 | .17491E+00 | .63527E+01 | .10035E+02 |
| .28609E-03 | .60063E+00 | -.32877E-02 | .19832E-67 | .17491E+00 | .60777E+01 | .10686E+02 |
| .32495E-03 | .66701E+00 | -.36494E-02 | .17968E-67 | .17490E+00 | .56840E+01 | .11379E+02 |
| .20825E-02 | .91295E+00 | -.59508E-01 | 0. | .14240E+00 | .30861E+01 | .13800E+02 |

AT FI = 120.00 CFINF = .68427E-02 STINF = .24401E-01 SHOCK DISTANCE = .48487E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .31801E-01 | .55093E+01 | .55093E+01 |
| .18187E-04 | .13405E-01 | .19463E-04 | .78734E-02 | .31812E-01 | .55816E+01 | .55841E+01 |
| .38193E-04 | .27940E-01 | .82939E-04 | .15170E-01 | .31824E-01 | .56538E+01 | .56671E+01 |
| .60017E-04 | .43584E-01 | .19890E-03 | .24803E-01 | .31837E-01 | .57263E+01 | .57585E+01 |
| .84115E-04 | .60557E-01 | .37980E-03 | .33852E-01 | .31850E-01 | .57988E+01 | .58604E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .11094E-03 | .79185E-01 | .64080E-03 | .43354E-01 | .31866E-01 | .56787E+01 | .59751E+01 |
| .14049E-03 | .99382E-01 | .99473E-03 | .53155E-01 | .31883E-01 | .5948[illegible]E+01 | .61027E+01 |
| .17277E-03 | .12110E+00 | .14521E-02 | .43101E-01 | .31902E-01 | .60891E+01 | .62438E+01 |
| .19051E-03 | .13289E+00 | .17315E-02 | .68845E-01 | .31912E-01 | .60363E+01 | .63222E+01 |
| .20825E-03 | .14459E+00 | .20293E-02 | .73165E-01 | .31923E-01 | .60646E+01 | .64886E+01 |
| .22779E-03 | .15738E+00 | .23774E-02 | .78335E-01 | .31935E-01 | .63929E+01 | .66802E+01 |
| .24735E-03 | .17008E+00 | .27448E-02 | .83252E-01 | .31947E-01 | .61178E+01 | .65741E+01 |
| .29054E-03 | .19780E+00 | .36182E-02 | .93224E-01 | .31975E-01 | .61599E+01 | .67721E+01 |
| .33828E-03 | .22797E+00 | .46635E-02 | .10290E+00 | .32085E-01 | .61988E+01 | .69917E+01 |
| .39102E-03 | .26079E+00 | .58942E-02 | .11283E+00 | .32042E-01 | .62063E+01 | .72388E+01 |
| .44922E-03 | .29649E+00 | .73155E-02 | .12433E+00 | .32081E-01 | .62827E+01 | .75139E+01 |
| .51333E-03 | .33524E+00 | .89266E-02 | .12748E+00 | .32129E-01 | [illegible] | .78223E+01 |
| .58361E-03 | .37727E+00 | .10714E-01 | .13900E+00 | .32176E-01 | .61184 | .81683E+01 |
| .66610E-03 | .42566E+00 | .12779E-01 | .13671E+00 | .32237E-01 | .6015 | .85795E+01 |
| .75650E-03 | .47811E+00 | .14966E-01 | .13955E+00 | .32291E-01 | .58693 | .90418E+01 |
| .48487E-02 | .96856E+00 | .42028E-01 | .16081E+00 | .34556E-01 | .14386E+0[illegible] | .13868E+02 |

AT FI = 130.00 CFINF = .61297E-02 STINF = .20999E-01 SHOCK DISTANCE = .52528E-02

| Y | U | V | d | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .27427E-01 | .55893E+01 | .55893E+01 |
| .19702E-04 | .13809E-01 | .19771E-04 | .68123E-02 | .27438E-01 | .55762E+01 | .55789E+01 |
| .41376E-04 | .27111E-01 | .34675E-04 | .14803E-01 | .27449E-01 | .56442E+01 | .56961E+01 |
| .65018E-04 | .42261E-01 | .20371E-03 | .21499E-01 | .27461E-01 | .57124E+01 | .57411E+01 |
| .91124E-04 | .58730E-01 | .39031E-03 | .23371E-01 | .27474E-01 | .57807E+01 | .58359E+01 |
| .12019E-03 | .76771E-01 | .66082E-03 | .37055E-01 | .27488E-01 | .58488E+01 | .59424E+01 |
| .15220E-03 | .96312E-01 | .10297E-02 | .46220E-01 | .27504E-01 | .59143E+01 | .60610E+01 |
| .18717E-03 | .11730E+00 | .15094E-02 | .54034E-01 | .27521E-01 | .59773E+01 | .61928E+01 |
| .20636E-03 | .12869E+00 | .18039E-02 | .59450E-01 | .27530E-01 | .60075E+01 | .62647E+01 |
| .22560E-03 | .13998E+00 | .21189E-02 | .63777E-01 | .27539E-01 | .60349E+01 | .63379E+01 |
| .24677E-03 | .15232E+00 | .24886E-02 | .68331E-01 | .27550E-01 | .60621E+01 | .64190E+01 |
| .26790E-03 | .16456E+00 | .28803E-02 | .72059E-01 | .27560E-01 | .60863E+01 | .65000E+01 |
| .31475E-03 | .19125E+00 | .38177E-02 | .81494E-01 | .27585E-01 | .61292E+01 | .66826E+01 |
| .36647E-03 | .22026E+00 | .49510E-02 | .90097E-01 | .27610E-01 | .61614E+01 | .68867E+01 |
| .42361E-03 | .25179E+00 | .63006E-02 | .93271E-01 | .27642E-01 | .61799E+01 | .71155E+01 |
| .48666E-03 | .28694E+00 | .78817E-02 | .10576E+00 | .27671E-01 | .61809E+01 | .73721E+01 |
| .55610E-03 | .32319E+00 | .97025E-02 | .11226E+00 | .27711E-01 | .61604E+01 | .76599E+01 |
| .63246E-03 | .36346E+00 | .11766E-01 | .11744E+00 | .27744E-01 | .61132E+01 | .79825E+01 |
| .72161E-03 | .40985E+00 | .14205E-01 | .12108E+00 | .27792E-01 | .60271E+01 | .83674E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .81963E-03 | .46019E+00 | .15879E-01 | .12235E+00 | .27828E-01 | .58953E+01 | .88013E+01 |
| .52528E-02 | .97429E+00 | .52354E-01 | .14487E+00 | .28956E-01 | .13460E+01 | .13800E+02 |

AT FI = 140.00 CFINF = .55134E-02 STINF = .18592E-01 SHOCK DISTANCE = .56172E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .24334E-01 | .55023E+01 | .55093E+01 |
| .21669E-04 | .12740E-01 | .19339E-04 | .56067E-02 | .24344E-01 | .55726E+01 | .55751E+01 |
| .44246E-04 | .26546E-01 | .83236E-04 | .11533E-01 | .24354E-01 | .56373E+01 | .56480E+01 |
| .69529E-04 | .41374E-01 | .20080E-03 | .17719E-01 | .24365E-01 | .57023E+01 | .57282E+01 |
| .97446E-04 | .57485E-01 | .38593E-03 | .24226E-01 | .24377E-01 | .57678E+01 | .58176E+01 |
| .12853E-03 | .75122E-01 | .63538E-03 | .31085E-01 | .24390E-01 | .58334E+01 | .59180E+01 |
| .16276E-03 | .94213E-01 | .10248E-02 | .38189E-01 | .24404E-01 | .58974E+01 | .60297E+01 |
| .20016E-03 | .11470E+00 | .15075E-02 | .45432E-01 | .24418E-01 | .59583E+01 | .61531E+01 |
| .22070E-03 | .12581E+00 | .18053E-02 | .49192E-01 | .24427E-01 | .59879E+01 | .62216E+01 |
| .24125E-03 | .13682E+00 | .21248E-02 | .52798E-01 | .24435E-01 | .60150E+01 | .62904E+01 |
| .26389E-03 | .14885E+00 | .25010E-02 | .56599E-01 | .24444E-01 | .60421E+01 | .63667E+01 |
| .28655E-03 | .16077E+00 | .29011E-02 | .60225E-01 | .24453E-01 | .60662E+01 | .64436E+01 |
| .33659E-03 | .18674E+00 | .38636E-02 | .67518E-01 | .24475E-01 | .61099E+01 | .66149E+01 |
| .39190E-03 | .21493E+00 | .50377E-02 | .74851E-01 | .24493E-01 | .61436E+01 | .68070E+01 |
| .45300E-03 | .24594E+00 | .64492E-02 | .81754E-01 | .24521E-01 | .61647E+01 | .70226E+01 |
| .52042E-03 | .27876E+00 | .81228E-02 | .88116E-01 | .24541E-01 | .61697E+01 | .72646E+01 |
| .59469E-03 | .31477E+00 | .10074E-01 | .93690E-01 | .24573E-01 | .61544E+01 | .75363E+01 |
| .67634E-03 | .35379E+00 | .12323E-01 | .98194E-01 | .24594E-01 | .61141E+01 | .78416E+01 |
| .77167E-03 | .39873E+00 | .15028E-01 | .10146E+00 | .24630E-01 | .60372E+01 | .82069E+01 |
| .87649E-03 | .44756E+00 | .18071E-01 | .10278E+00 | .24650E-01 | .59170E+01 | .86204E+01 |
| .56172E-02 | .97988E+00 | .60033E-01 | .12385E+00 | .24385E-01 | .12675E+01 | .13800E+02 |

AT FI = 150.00 CFINF = .52559E-02 STINF = .16971E-01 SHOCK DISTANCE = .59184E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .22198E-01 | .55093E+01 | .55093E+01 |
| .22199E-04 | .12569E-01 | .18582E-04 | .42976E-02 | .22207E-01 | .55702E+01 | .55724E+01 |
| .46619E-04 | .26186E-01 | .84422E-04 | .88444E-02 | .22216E-01 | .56326E+01 | .56424E+01 |
| .73257E-04 | .40809E-01 | .19443E-03 | .13596E-01 | .22226E-01 | .56956E+01 | .57193E+01 |
| .10267E-03 | .56691E-01 | .37475E-03 | .18500E-01 | .22237E-01 | .57593E+01 | .58048E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .13542E-03 | .74072E-01 | .63803E-03 | .23881E-01 | .22248E-01 | .53234E+01 | .59910E+01 |
| .17149E-03 | .92875E-01 | .10007E-02 | .29350E-01 | .22262E-01 | .58864E+01 | .60[illegible]E+01 |
| .21089E-03 | .11304E+00 | .14785E-02 | .34951E-01 | .22274E-01 | .59468E+01 | .61258E+01 |
| .23294E-03 | .12397E+00 | .17713E-02 | .37858E-01 | .22282E-01 | .59781E+01 | .61912E+01 |
| .25[illegible] | .13480E+00 | .20884E-02 | .40649E-01 | .22293E-01 | .60032E+01 | .62578E+01 |
| .27884E-03 | .14662E+00 | .24626E-02 | .43593E-01 | .22297E-01 | .60303E+01 | .63299E+01 |
| .30192E-03 | .15834E+00 | .28621E-02 | .46434E-01 | .22304E-01 | .60547E+01 | .64833E+01 |
| .35467E-03 | .18386E+00 | .38272E-02 | .52195E-01 | .22324E-01 | .60994E+01 | .65670E+01 |
| .41297E-03 | .21193E+00 | .50133E-02 | .57777E-01 | .22337E-01 | .61348E+01 | .67569E+01 |
| .47729E-03 | .24153E+00 | .64499E-02 | .63169E-01 | .22361E-01 | .61583E+01 | .69566E+01 |
| .54833E-03 | .27467E+00 | .81706E-02 | .68160E-01 | .22373E-01 | .61664E+01 | .71882E+01 |
| .62657E-03 | .30934E+00 | .10195E-01 | .72557E-01 | .22398E-01 | .61558E+01 | .74486E+01 |
| .71250E-03 | .34753E+00 | .12562E-01 | .76145E-01 | .22409E-01 | .61194E+01 | .77416E+01 |
| .81305E-03 | .39153E+00 | .15444E-01 | .78793E-01 | .22434E-01 | .60486E+01 | .80933E+01 |
| .92349E-03 | .43936E+00 | .18749E-01 | .79953E-01 | .22441E-01 | .59354E+01 | .84926E+01 |
| .59184E-02 | .98507E+00 | .64730E-01 | .98060E-01 | .20776E-01 | .12026E+01 | .13800E+02 |

AT FI = 160.00 CFINF = .50243E-02 STINF = .15955E-01 SHOCK DISTANCE = .61387E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .20803E-01 | .55093E+01 | .55093E+01 |
| .23026E-04 | .12462E-01 | .17899E-04 | .29130E-02 | .20811E-01 | .55687E+01 | .55700E+01 |
| .48354E-04 | .25964E-01 | .77855E-04 | .59060E-02 | .20820E-01 | .56297E+01 | .56388E+01 |
| .75985E-04 | .40460E-01 | .18851E-03 | .92220E-02 | .20828E-01 | .56915E+01 | .57135E+01 |
| .10649E-03 | .56204E-01 | .36417E-03 | .12621E-01 | .20839E-01 | .57542E+01 | .57967E+01 |
| .14045E-03 | .73429E-01 | .62118E-03 | .15211E-01 | .20849E-01 | .58176E+01 | .58900E+01 |
| .17787E-03 | .92059E-01 | .97651E-03 | .19338E-01 | .20862E-01 | .58801E+01 | .59937E+01 |
| .21874E-03 | .11203E+00 | .14442E-02 | .23747E-01 | .20872E-01 | .59402E+01 | .61081E+01 |
| .24120E-03 | .12286E+00 | .17340E-02 | .25728E-01 | .20879E-01 | .59698E+01 | .61715E+01 |
| .26365E-03 | .13358E+00 | .20481E-02 | .27631E-01 | .20885E-01 | .59978E+01 | .62352E+01 |
| .28840E-03 | .14528E+00 | .24186E-02 | .29640E-01 | .20893E-01 | .60244E+01 | .63059E+01 |
| .31315E-03 | .15667E+00 | .28140E-02 | .31560E-01 | .20898E-01 | .60492E+01 | .63771E+01 |
| .36784E-03 | .18210E+00 | .37755E-02 | .35485E-01 | .20917E-01 | .60949E+01 | .65357E+01 |
| .42828E-03 | .20946E+00 | .49626E-02 | .39347E-01 | .20925E-01 | .61318E+01 | .67136E+01 |
| .49506E-03 | .23913E+00 | .64080E-02 | .43[illegible]E-01 | .20947E-01 | .61572E+01 | .69134E+01 |
| .56874E-03 | .27128E+00 | .81521E-02 | .46475E-01 | .20952E-01 | .61677E+01 | .71381E+01 |
| .64990E-03 | .30610E+00 | .10218E-01 | .49511E-01 | .20974E-01 | .61598E+01 | .73911E+01 |
| .73913E-03 | .34381E+00 | .12654E-01 | .52003E-01 | .20975E-01 | .61265E+01 | .76762E+01 |
| .84332E-03 | .38725E+00 | .15647E-01 | .53863E-01 | .20993E-01 | .60592E+01 | .80190E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .95787E-03 | .43447E+00 | .19123E+01 | .54714E-01 | .20988E-01 | .59500E+01 | .84092E+01 |
| .61387E-02 | .98948E+00 | .66567E-01 | .68110E-01 | .18091E-01 | .11517E+01 | .13880E+02 |

AT FI = 170.00 CFINF = .49007E-02 STINF = .15407E-01 SHOCK DISTANCE = .32688E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .20007E-01 | .55093E+01 | .55093E+01 |
| .23513E-04 | .12413E-01 | .17412E-04 | .14727E-02 | .20014E-01 | .55678E+01 | .55598E+01 |
| .49379E-04 | .25861E-01 | .78055E-04 | .30323E-02 | .20023E-01 | .56281E+01 | .56368E+01 |
| .77596E-04 | .40996E-01 | .19428E-03 | .46640E-02 | .20031E-01 | .56893E+01 | .57104E+01 |
| .10875E-03 | .55976E-01 | .35651E-03 | .63842E-02 | .20042E-01 | .57515E+01 | .57921E+01 |
| .14344E-03 | .73127E-01 | .60873E-03 | .82072E-02 | .20050E-01 | .58146E+01 | .58839E+01 |
| .18164E-03 | .91673E-01 | .95826E-03 | .10090E-01 | .20063E-01 | .58769E+01 | .59858E+01 |
| .22337E-03 | .11155E+00 | .14190E-02 | .12021E-01 | .20072E-01 | .59370E+01 | .60962E+01 |
| .24631E-03 | .12232E+00 | .17059E-02 | .13026E-01 | .20079E-01 | .59667E+01 | .61605E+01 |
| .26924E-03 | .13299E+00 | .20153E-02 | .13992E-01 | .20083E-01 | .59942E+01 | .62231E+01 |
| .29451E-03 | .14463E+00 | .23819E-02 | .15011E-01 | .20091E-01 | .60218E+01 | .62925E+01 |
| .31979E-03 | .15616E+00 | .27743E-02 | .15985E-01 | .20095E-01 | .60459E+01 | .63624E+01 |
| .37563E-03 | .18125E+00 | .37275E-02 | .17979E-01 | .20114E-01 | .60933E+01 | .65181E+01 |
| .43736E-03 | .20845E+00 | .49093E-02 | .19940E-01 | .20118E-01 | .61312E+01 | .66928E+01 |
| .50555E-03 | .23792E+00 | .63523E-02 | .21823E-01 | .20139E-01 | .61579E+01 | .68091E+01 |
| .58079E-03 | .26985E+00 | .81014E-02 | .23574E-01 | .20139E-01 | .61690E+01 | .71099E+01 |
| .66367E-03 | .30444E+00 | .10180E-01 | .25124E-01 | .20159E-01 | .61628E+01 | .73546E+01 |
| .75479E-03 | .34188E+00 | .12646E-01 | .26400E-01 | .20154E-01 | .61321E+01 | .76392E+01 |
| .86119E-03 | .38500E+00 | .15688E-01 | .27353E-01 | .20168E-01 | .60669E+01 | .79769E+01 |
| .97817E-03 | .43187E+00 | .19252E-01 | .27605E-01 | .20155E-01 | .59598E+01 | .83618E+01 |
| .11075E-02 | .48328E+00 | .23316E-01 | .27851E-01 | .20149E-01 | .57991E+01 | .88052E+01 |
| .12498E-02 | .53950E+00 | .28013E-01 | .26724E-01 | .20125E-01 | .55719E+01 | .93157E+01 |
| .14050E-02 | .60065E+00 | .33158E-01 | .25012E-01 | .20076E-01 | .52803E+01 | .99003E+01 |
| .15754E-02 | .66755E+00 | .39054E-01 | .22429E-01 | .20032E-01 | .48439E+01 | .10573E+02 |
| .17629E-02 | .74042E+00 | .45353E-01 | .18997E-01 | .19881E-01 | .42946E+01 | .11343E+02 |
| .19693E-02 | .81850E+00 | .52627E-01 | .14813E-01 | .19777E-01 | .35662E+01 | .12200E+02 |
| .21962E-02 | .89799E+00 | .59912E-01 | .10355E-01 | .19376E-01 | .27143E+01 | .13073E+02 |
| .24318E-02 | .96218E+00 | .67224E-01 | .66531E-02 | .19038E-01 | .18196E+01 | .13728E+02 |
| .26676E-02 | .98840E+00 | .72144E-01 | .57062E-02 | .18478E-01 | .12949E+01 | .13867E+02 |
| .29033E-02 | .99320E+00 | .72963E-01 | .73793E-02 | .18125E-01 | .11964E+01 | .13790E+02 |
| .31391E-02 | .99310E+00 | .73064E-01 | .10068E-01 | .17669E-01 | .11987E+01 | .13791E+02 |
| .33743E-02 | .99044E+00 | .72754E-01 | .12843E-01 | .17285E-01 | .11749E+01 | .13801E+02 |
| .36093E-02 | .99070E+00 | .72561E-01 | .15933E-01 | .16884E-01 | .11591E+01 | .13793E+02 |
| .38445E-02 | .99134E+00 | .71906E-01 | .19065E-01 | .16645E-01 | .11468E+01 | .13797E+02 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .40796E-02 | .99166E+00 | .71587E-01 | .22327E-01 | .16495E-01 | .11358E+01 | .13795E+02 |
| .43148E-02 | .99185E+00 | .70996E-01 | .25651E-01 | .16509E-01 | .11297E+01 | .13795E+02 |
| .45499E-02 | .99195E+00 | .70825E-01 | .28943E-01 | .16594E-01 | .11254E+01 | .13795E+02 |
| .47791E-02 | .99190E+00 | .70685E-01 | .31894E-01 | .16758E-01 | .11242E+01 | .13795E+02 |
| .49849E-02 | .99182E+00 | .71008E-01 | .34040E-01 | .16913E-01 | .11241E+01 | .13795E+02 |
| .51672E-02 | .99171E+00 | .71350E-01 | .35302E-01 | .17060E-01 | .11253E+01 | .13795E+02 |
| .53317E-02 | .99160E+00 | .71819E-01 | .35850E-01 | .17191E-01 | .11269E+01 | .13795E+02 |
| .54787E-02 | .99151E+00 | .72185E-01 | .35339E-01 | .17305E-01 | .11280E+01 | .13796E+02 |
| .56139E-02 | .99142E+00 | .72599E-01 | .35607E-01 | .17412E-01 | .11306E+01 | .13796E+02 |
| .57374E-02 | .99136E+00 | .72815E-01 | .35614E-01 | .17497E-01 | .11321E+01 | .13796E+02 |
| .58490E-02 | .99131E+00 | .73076E-01 | .35424E-01 | .17580E-01 | .11335E+01 | .13796E+02 |
| .59489E-02 | .99128E+00 | .73199E-01 | .35297E-01 | .17625E-01 | .11343E+01 | .13797E+02 |
| .60395E-02 | .99123E+00 | .73415E-01 | .35105E-01 | .17703E-01 | .11355E+01 | .13797E+02 |
| .61218E-02 | .99131E+00 | .72989E-01 | .34979E-01 | .17637E-01 | .11347E+01 | .13797E+02 |
| .61982E-02 | .99104E+00 | .74343E-01 | .34822E-01 | .17950E-01 | .11388E+01 | .13797E+02 |
| .62688E-02 | .99256E+00 | .66456E-01 | .34351E-01 | .16375E-01 | .11176E+01 | .13800E+02 |

AT FI = 180.00 CFINF = .48619E-02 SFINF = .15235E-01 SHOCK DISTANCE = .63111E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .19749E-01 | .55893E+01 | .55893E+01 |
| .23672E-04 | .12398E-01 | .17212E-04 | -.27867E-16 | .19757E-01 | .55676E+01 | .55695E+01 |
| .49712E-04 | .25029E-01 | .79270E-04 | -.98279E-16 | .19765E-01 | .55277E+01 | .56362E+01 |
| .78118E-04 | .40268E-01 | .18244E-03 | -.91185E-16 | .19773E-01 | .56886E+01 | .57094E+01 |
| .10948E-03 | .55904E-01 | .35314E-03 | -.12725E-15 | .19783E-01 | .57507E+01 | .57907E+01 |
| .14441E-03 | .73031E-01 | .60322E-03 | -.15714E-15 | .19792E-01 | .58137E+01 | .58819E+01 |
| .18287E-03 | .91549E-01 | .95087E-03 | -.21083E-15 | .19805E-01 | .58760E+01 | .59833E+01 |
| .22488E-03 | .11140E+00 | .14076E-02 | -.25041E-15 | .19812E-01 | .59362E+01 | .60950E+01 |
| .24797E-03 | .12215E+00 | .16926E-02 | -.20456E-15 | .19819E-01 | .59699E+01 | .61569E+01 |
| .27105E-03 | .13208E+00 | .20002E-02 | -.31373E-15 | .19824E-01 | .59934E+01 | .62192E+01 |
| .29649E-03 | .14442E+00 | .23649E-02 | -.33963E-15 | .19831E-01 | .60211E+01 | .62882E+01 |
| .32194E-03 | .15513E+00 | .27592E-02 | -.36664E-15 | .19835E-01 | .60463E+01 | .63576E+01 |
| .37817E-03 | .18097E+00 | .37043E-02 | -.43325E-15 | .19854E-01 | .60938E+01 | .65124E+01 |
| .44030E-03 | .20811E+00 | .48824E-02 | -.50598E-15 | .19857E-01 | .61314E+01 | .66860E+01 |
| .50896E-03 | .23793E+00 | .63225E-02 | -.58673E-15 | .19877E-01 | .61585E+01 | .68811E+01 |
| .58471E-03 | .26939E+00 | .80710E-02 | -.68402E-15 | .19876E-01 | .61709E+01 | .71087E+01 |
| .65815E-03 | .30309E+00 | .10152E-01 | -.79546E-15 | .19895E-01 | .61646E+01 | .73480E+01 |
| .75968E-03 | .34114E+00 | .12629E-01 | -.92828E-15 | .19888E-01 | .61345E+01 | .76270E+01 |
| .86699E-03 | .38424E+00 | .15683E-01 | -.11212E-14 | .19901E-01 | .60700E+01 | .79638E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| .98476E-03 | .43160E+00 | .19275E-01 | -.13207E-14 | .19885E-01 | .59637E+01 | .83462E+01 |
| .63111E-02 | .99363E+00 | .56080E-01 | -.71319E-15 | .15771E-01 | .11052E+01 | .13800E+02 |

# APPENDIX F

# PROGRAM LISTING

```
      PROGRAM  AOFA(INPUT,OUTPUT,              TAPE5=INPUT,TAPE6=OUTPUT,
     &                TAPE2,TAPE3,TAPE4)
C          THIS IS THE MAIN ROUTINE.
C          THE MAXIMUM SIZE OF ALL ARRAYS IS SPECIFIED IN THE
C          DIMENSION STATEMENT.  IF MAXJ,MAXK,MAXL DENOTE THE
C          UPPER BOUNDS FOR J,K,L, AND MAXKL DENOTES THE LARGER
C          OF MAXK AND MAXL THEN THE ARRAYS ARE DIMENSIONED
C          DEPVAR(MAXK*MAXL,18)
C          ABCFD(MAXKL,120)
C          ET(MAXK),FI(MAXL),X(MAXJ)
C          INETFI(MAXL),INFIET(MAXK)
C          VB(MAXJ,MAXL),HB(MAXJ,MAXL)
C          COEFF(MAXJ,MAXL),DEL((MAXK-1)*6),RISIDE((MAXK-1)*6),
C          WORK1(1,1),WORK2(1),WORK3(1),WORK4(1).
C          IF MAXK IS GREATER THAN 108 THEN THE DIMENSION OF Y IN
C          BLANK COMMON SHOULD BE MAXK.
C
C
C          TAPE2 IS AN OUTPUT UNIT, SEE SUBROUTINE OUTPUT.
C          TAPE3 AND TAPE4 ARE INPUT AND OUTPUT UNITS,
C          SEE SUBROUTINES BCIC AND OUTPUT.
C
C
C          PROBLEM PARAMETERS ARE READ USING NAMELIST IN THE MAIN
C          ROUTINE.  FOR OTHER INPUT SEE SUBROUTINE BCIC.
C
C
C          THERE ARE A FEW UNCONVENTIONAL (AND FRUSTRATING IF FORGOTTEN)
C          THINGS IN THE PROGRAM.  SEE SUBROUTINES FLCFLD, IMPETA, BCIC,
C          AND OUTPUT, THE COMMENTS ARE INDICATED WITH ASTERISKS ****.
      REAL   ME,MINF
      LEVEL 2,DEPVAR,ABCFD,COEFF,WORK1
      LEVEL 2,U,UJP1,UJM1,V,VJP1,VJM1,W,WJP1,WJM1,H,HJP1,HJM1,
     &        P,PJP1,PJM1,ZI,ZIJP1,ZIJM1,A,B,C,F,DELU,DELV,DELW,DELH,
     &        DELP,DELZI
      LEVEL 2,UNEW,VNEW,WNEW,PNEW,HNEW,ZINEW,HBNEW,VBNEW,ETNEW,FINEW
C          THE ARRAY UVWPHZ IS NEEDED ONLY BECAUSE THE CDC7600 JUMBLES
C          LARGE CORE ARRAYS WHEN THEY ARE INPUT OR OUTPUT WITHOUT
C          FORMAT CONTROL.  THE ARRAY IS USED IN SUBROUTINES BCIC AND
C          OUTPUT.  HERE IT SHOULD BE DIMENSIONED UVWPHZ(MAXK,MAXL,6).
      COMMON /OUTDEP/ UVWPHZ( 50,20,6)
      DIMENSION DEPVAR(1000,18)
      DIMENSION ABCFD(50,120)
      DIMENSION
```

```
&          ET(50),FI(20),X(31),
&          INETFI(20),INFIET(50),
&          VB(31,20),HB(31,20),
&          COEFF(31,20),DEL(294),RTSIDE(294),
&          WORK1(1,1),WORK2(1),WORK3(1),WORK4(1)
 EQUIVALENCE (INFIET(1),INETFI(1))
 DIMENSION
&    U(1,1), UJP1(1,1), UJM1(1,1), V(1,1), VJP1(1,1), VJM1(1,1),
&    W(1,1), WJP1(1,1), WJM1(1,1), H(1,1), HJP1(1,1), HJM1(1,1),
&    P(1,1), PJP1(1,1), PJM1(1,1),ZI(1,1),ZIJP1(1,1),ZIJM1(1,1)
 EQUIVALENCE ( U   (1,1),DEPVAR(1, 1)),( UJP1(1,1),DEPVAR(1, 2)),
&            ( UJM1(1,1),DEPVAR(1, 3)),( V   (1,1),DEPVAR(1, 4)),
&            ( VJP1(1,1),DEPVAR(1, 5)),( VJM1(1,1),DEPVAR(1, 6)),
&            ( W   (1,1),DEPVAR(1, 7)),( WJP1(1,1),DEPVAR(1, 8)),
&            ( WJM1(1,1),DEPVAR(1, 9)),( H   (1,1),DEPVAR(1,10)),
&            ( HJP1(1,1),DEPVAR(1,11)),( HJM1(1,1),DEPVAR(1,12)),
&            ( P   (1,1),DEPVAR(1,13)),( PJP1(1,1),DEPVAR(1,14)),
&            ( PJM1(1,1),DEPVAR(1,15)),(ZI   (1,1),DEPVAR(1,16)),
&            (ZIJP1(1,1),DEPVAR(1,17)),(ZIJM1(1,1),DEPVAR(1,18))
 DIMENSION A(6,6,1),B(6,6,1),C(6,6,1),F(6,1),
&          DELU(1),DELV(1),DELW(1),DELH(1),DELP(1),DELZI(1)
 EQUIVALENCE (A(1,1,1),ABCFD(1,  1)),(B(1,1,1),ABCFD(1, 37)),
&            (C(1,1,1),ABCFD(1, 73)),(F(1,1)  ,ABCFD(1,109)),
&            (DELU(1) ,ABCFD(1,115)),(DELV(1) ,ABCFD(1,116)),
&            (DELW(1) ,ABCFD(1,117)),(DELH(1) ,ABCFD(1,118)),
&            (DELP(1) ,ABCFD(1,119)),(DELZI(1),ABCFD(1,120))
 EQUIVALENCE (A(1),WORK1(1))
 EQUIVALENCE (WORK2(1),WORK3(1),WORK4(1))
 DIMENSION UNEW(1,1), VNEW(1,1), WNEW(1,1), PNEW(1,1),
&          HNEW(1,1),ZINEW(1,1),
&         VBNEW(1,1),HBNEW(1,1)
 EQUIVALENCE (VBNEW(1,1),ABCFD(1,3)),(HBNEW(1,1),COEFF(1,1))
 DIMENSION ETNEW(1),FINEW(1)
 EQUIVALENCE (ETNEW(1),ABCFD(1,1)),(FINEW(1),ABCFD(1,2))
 EQUIVALENCE (U(1,1),UNEW(1,1)),(V(1,1),VNEW(1,1)),
&            (W(1,1),WNEW(1,1)),(P(1,1),PNEW(1,1)),
&            (H(1,1),HNEW(1,1)),
&            (ZI(1,1),ZINEW(1,1))
 COMMON Y(108)
 COMMON /DVARS/DEPVAR
 COMMON /BIGMAT/ COEFF
 COMMON /SEQ/ ABCFD
 COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,
&         MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP
```

```
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1
      COMMON /PUNCH/ ITAPE
      LOGICAL MOD
C          THE FOLLOWING PARAMETERS ARE INPUT WITH NAMELIST
C          GAMMA = RATIO OF SPECIFIC HEATS
C          MINF  = FREESTREAM MACH NUMBER
C          THETAC= CONE HALF-ANGLE (DEG)
C          REINF = FREESTREAM REYNOLDS NUMBER (/FT)
C          PRINF = FREESTREAM PRANDTL NUMBER
C          ALFA  = ANGLE OF ATTACK (DEG)
C          PINF  = DIMENSIONLESS FREESTREAM PRESSURE
C          SPROP = SUTHERLAND CONSTANT USED IN VISCOSITY LAW
C          NJ    = NUMBER OF X-STATIONS
C          NK    = NUMBER OF Y-STATIONS
C          NL    = NUMBER OF PHI-STATIONS
C          MOD   = .TRUE. OR .FALSE. DEPENDING ON WHETHER THE INITIAL
C                  CONDITIONS ARE TO BE MODIFIED OR NOT, DEFAULT=.FALSE.
C          ITAPE = 0 NO OUTPUT ON TAPE2, THIS IS THE DEFAULT VALUE
C                = N OUTPUT SOLUTION ON TAPE2 EVERY NTH X-STATION.
      NAMELIST /INPUT/ GAMMA,MINF,THETAC,REINF,PRINF,ALFA,
     &                 PINF,SPROP,NJ,NK,NL,MOD,ITAPE
      J = 0
      MOD = .FALSE.
      ITAPE=0
      READ (5,INPUT)
      WRITE (6,INPUT)
      THETAC=THETAC*.0174532925199433
      ALFA=ALFA*.0174532925199433
      RREINF=1./REINF
      RPRRE=RREINF/PRINF
      ME=(GAMMA-1.)*MINF*MINF
      VELINF = 1.
      HBAR = 1. + ME/2.
      RREME=ME*RREINF
      GM2=GAMMA*MINF*MINF
      COSTC=COS(THETAC)
      SINTC=SIN(THETAC)
      COSALF=COS(ALFA)
      SINALF=SIN(ALFA)
      CTCA=COSTC*COSALF
      STSA=SINTC*SINALF
      STCA=SINTC*COSALF
      CTSA=COSTC*SINALF
C          OBTAIN THE BOUNDARY CONDITIONS AND THE INITIAL CONDITIONS.
```

```
      CALL BCIC (NJ,NK,NL,U,V,W,H,P,ZI,UJM1,VJM1,WJM1,HJM1,PJM1,ZIJM1,
     &                    ET,FI,X,VB,HB)
      REWIND 3
      NEWNK = NK
      NEWNL = NL
      IF (.NOT.MOD) GO TO 100
C          OUTPUT THE INITIAL CONDITIONS BEFORE THEY ARE MODIFIED.
      CALL OUTPUT (NK,NL,X(1),ET,FI,U,V,W,H,P,ZI)
C          IF THE SOLUTION IS TO BE MODIFIED READ IN A NEW VALUE FOR
C          NK AND/OR NL.
      READ (5,5010) NEWK,NEWL
 5010 FORMAT (2I5)
      IF (NEWK.LE.0) GO TO 50
      NEWNK = NEWK
C          READ IN A NEW NORMAL DISTRIBUTION.
      READ (5,5020) (ETNEW(K),K=1,NEWNK)
 5020 FORMAT (6E12.4)
      DO 40 K=1,NEWNK
      ETNEW(K) = ETNEW(K)/  ETNEW(NEWNK)
   40 CONTINUE
      ETNEW(1) = 0.0
      ETNEW(NEWNK) = 1.0
      GO TO 55
   50 CONTINUE
      DO 52 K=1,NK
      ETNEW(K) = ET(K)
   52 CONTINUE
   55 CONTINUE
      IF (NEWL.LE.0) GO TO 70
      NEWNL = NEWL
C          READ IN A NEW CIRCUMFERENTIAL DISTRIBUTION (DEG).
      READ (5,5020) (FINEW(L),L=1,NEWNL)
      DO 60 L=1,NEWNL
      FINEW(L) = FINEW(L) * .01745329252
   60 CONTINUE
      FINEW(1) = 0.0
      FINEW(NEWNL) = 180.00 * .01745329252
      GO TO 75
   70 CONTINUE
      DO 72 L=1,NL
      FINEW(L) = FI(L)
   72 CONTINUE
   75 CONTINUE
C          INTERPOLATE TO OBTAIN THE SOLUTION AT THE NEW MESH
```

```
C          DISTRIBUTION FOR EACH OF THE INPUT PLANES.
      CALL MODIFY (NK,NL,NEWNK,NEWNL,ET,FI,ETNEW,FINEW,
     &             UJM1,UJP1,UJM1,VJM1,VJP1,VJM1,WJM1,WJP1,WJM1,
     &             PJM1,PJP1,PJM1,HJM1,HJP1,HJM1,
     &             ZIJM1,ZIJP1,ZIJM1,
     &                  UNEW,VNEW,WNEW,PNEW,HNEW,ZINEW,
     &             NJ,VB,HB,VBNEW,HBNEW)
      CALL MODIFY (NK,NL,NEWNK,NEWNL,ET,FI,ETNEW,FINEW,
     &             U,UJP1,U,V,VJP1,V,W,WJP1,W,
     &             P,PJP1,P,H,HJP1,H,
     &             ZI,ZIJP1,ZI,
     &                  UNEW,VNEW,WNEW,PNEW,HNEW,ZINEW,
     &             NJ,VB,HB,VBNEW,HBNEW)
      NK = NEWNK
      NL = NEWNL
      WRITE (6,INPUT)
  100 CONTINUE
      REWIND 4
      WRITE (4) GAMMA,MINF,THETAC,REINF,PRINF,ALFA,PINF,SPROP,NJ,NK,NL
C          OUTPUT THE INITIAL CONDITIONS
      CALL OUTPUT (NK,NL,XI17,ET,FI,U,V,W,H,P,ZI)
      NKM1=NK-1
      NKM16=NKM1*6
      NL5=NL*5
      CALL FLOFLD(NJ,NK,NL,NKM1,NKM16,NL5,U,V,W,H,P,ZI,UJP1,VJP1,
     &            WJP1,HJP1,PJP1,ZIJP1,UJM1,VJM1,WJM1,HJM1,PJM1,
     &            ZIJM1,VB,HB,
     &            DELU,DELV,DELW,DELH,DELP,DELZI,
     &            INETFI,INFIET,KSUP,PJM1FI,
     &            ET,FI,X,A,B,C,F,DEL,RTSIDE,WORK1,WORK2,
     &            WORK3,WORK4)
      STOP
      END
      SUBROUTINE FLOFLD (NJ,NK,NL,NKM1,NKM16,NL5,U,V,W,H,P,ZI,UJP1,VJP1,
     &                   WJP1,HJP1,PJP1,ZIJP1,UJM1,VJM1,WJM1,HJM1,PJM1,
     &                   ZIJM1,VB,HB,
     &                   DELU,DELV,DELW,DELH,DELP,DELZI,
     &                   INETFI,INFIET,KSUP,PJM1FI,
     &                   ET,FI,X,A,B,C,F,DEL,RTSIDE,WORK1,WORK2,
     &                   WORK3,WORK4)
C          THIS SUBROUTINE COMPUTES THE INITIAL GUESS TO THE SOLUTION
C          AT THE NEXT X-STATION, AND CONTROLS THE MARCHING IN X.
      REAL   ME,MINF
      LEVEL 2,U,UJP1,UJM1,V,VJP1,VJM1,W,WJP1,WJM1,P,PJP1,PJM1,
```

```
     &        H,HJP1,HJM1,ZI,ZIJP1,ZIJM1,                                02210
     &        DELU,DELV,DELW,DELP,DELH,DELZI,                            02220
     &        A,B,C,F,WORK1                                              02230
      DIMENSION U(NK,NL),V(NK,NL),W(NK,NL),H(NK,NL),P(NK,NL),ZI(NK,NL).  02240
     &          UJP1(NK,NL),VJP1(NK,NL),WJP1(NK,NL),HJP1(NK,NL),         02250
     &          PJP1(NK,NL),ZIJP1(NK,NL),                                02260
     &          UJM1(NK,NL),VJM1(NK,NL),WJM1(NK,NL),HJM1(NK,NL),         02270
     &          PJM1(NK,NL),ZIJM1(NK,NL),                                02280
     &          VB(NJ,NL),HB(NJ,NL),                                     02290
     &          ET(NK),FI(NL),X(NJ)                                      02300
      DIMENSION DELU(NK),DELV(NK),DELW(NK),DELH(NK),DELP(NK),DELZI(NK)  02310
      DIMENSION INETFI(NL),INFIET(NK)                                   02320
      DIMENSION A(6,6,NK),B(6,6,NK),C(6,6,NK),F(6,NK)                   02330
      DIMENSION DEL(NKM16),RTSIDE(NKM16)                                02340
      DIMENSION WORK1(1),WORK2(1),WORK3(1),WORK4(1)                     02350
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,  02360
     &         MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP     02370
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1                      02380
      COMMON /ITRATE/ ITER,ITCOUN                                       02390
      J=1                                                               02400
C**********THE FOLLOWING CARD MUST BE SET CORRECTLY FOR EACH RUN.*******  02410
C**********THE NUMBER PUT ON IT MUST BE EQUAL TO THE X-STEP TAKEN TO****  02420
C**********GET TO THE PLANE OF INITIAL CONDITIONS READ IN FROM THE******  02430
C**********PREVIOUS X-STATION.  THIS IS SO THE INITIAL BACKWARDS********  02440
C**********EVALUATION OF DU/DX WILL BE CORRECT.************************  02450
      XJ = X(1) - .0012                                                 02460
      XJP1=X(1)                                                         02470
  200 CONTINUE                                                          02480
      JM1=J-1                                                           02490
      JP1=J+1                                                           02500
      XJM1=XJ                                                           02510
      XJ=XJP1                                                           02520
      XJP1=X(JP1)                                                       02530
      DXJM1=XJ-XJM1                                                     02540
      DX=XJP1-XJ                                                        02550
      DO 25 LDUM=1,NL                                                   02560
C          OBTAIN THE INITIAL GUESS                                     02570
      DO 20 K=1,NK                                                      02580
      UJP1(K,LDUM)=U(K,LDUM)+(U(K,LDUM)-UJM1(K,LDUM))*DX/DXJM1          02590
      VJP1(K,LDUM)=V(K,LDUM)+(V(K,LDUM)-VJM1(K,LDUM))*DX/DXJM1          02600
      WJP1(K,LDUM)=W(K,LDUM)+(W(K,LDUM)-WJM1(K,LDUM))*DX/DXJM1          02610
      HJP1(K,LDUM)=H(K,LDUM)+(H(K,LDUM)-HJM1(K,LDUM))*DX/DXJM1          02620
      PJP1(K,LDUM)=P(K,LDUM)+(P(K,LDUM)-PJM1(K,LDUM))*DX/DXJM1          02630
      ZIJP1(K,LDUM)=ZI(K,LDUM)+(ZI(K,LDUM)-ZIJM1(K,LDUM))*DX/DXJM1      02640
```

```
   20 CONTINUE
   25 CONTINUE
      DO 30 L=1,NL
      INETFI(L) = 1
   30 CONTINUE
      DO 275 ITCOUN=1,40
      ITER = 0
C           CALL THE SUBROUTINE THAT ADVANCES THE SOLUTION TO THE
C           NEXT X-LOCATION USING A METHOD THAT IS IMPLICIT IN ETA.
C           AND ITERATIVE IN PHI.
      CALL IMPETA (NJ,NK,NL,NKM1,NKM16,U,V,W,H,P,ZI,UJP1,VJP1,WJP1,
     &             HJP1,PJP1,ZIJP1,UJM1,VJM1,WJM1,HJM1,PJM1,ZIJM1,
     &             VB,HB,
     &             DELU,DELV,DELW,DELH,DELP,DELZI,
     &             INETFI,
     &             ET,FI,X,A,B,C,F,DEL,RTSIDE,WORK1,WORK2,WORK3,WORK4)
      WRITE (6,6973)  ITER,(INETFI(KJ),KJ=1,NL)
      IF (ITER.LT.0)  GO TO 287
      IF (ITER.EQ.0)  GO TO 276
  275 CONTINUE
  276 CONTINUE
 6973 FORMAT (*   ITER,INS *,40I2)
  287 CONTINUE
C           OUTPUT THE SOLUTION AT X(J+1).
      CALL OUTPUT (NK,NL,XJP1,ET,FI,UJP1,VJP1,WJP1,HJP1,PJP1,
     &             ZIJP1)
      IF (ITER.LT.0)  RETURN
      J=J+1
      IF (J.GE.NJ)  GO TO 300
C           REDEFINE THE SOLUTION AT X(J) AND X(J-1).
      DO 290 L=1,NL
      DO 290 K=1,NK
      QZ1=U(K,L)
      U(K,L)=UJP1(K,L)
      UJM1(K,L)=QZ1
      QZ1=V(K,L)
      V(K,L)=VJP1(K,L)
      VJM1(K,L)=QZ1
      QZ1=W(K,L)
      W(K,L)=WJP1(K,L)
      WJM1(K,L)=QZ1
      QZ1=H(K,L)
      H(K,L)=HJP1(K,L)
      HJM1(K,L)=QZ1
```

```
      QZI=P(K,L)
      P(K,L)=PJP1(K,L)
      PJM1(K,L)=QZI
      QZI=ZI(K,L)
      ZI(K,L)=ZIJP1(K,L)
      ZIJM1(K,L)=QZI
  290 CONTINUE
      GO TO 200
  300 CONTINUE
      RETURN
      END
      SUBROUTINE IMPETA (NJ,NK,NL,NKM1,NKM16,U,V,W,H,P,ZI,UJP1,VJP1,
     &                   WJP1,HJP1,PJP1,ZIJP1,UJM1,VJM1,WJM1,HJM1,PJM1,
     &                   ZIJM1,VB,HB,
     &                   DELU,DELV,DELW,DELH,DELP,DELZI,
     &                   INETFI,
     &                   ET,FI,X,A,B,C,F,DEL,RTSIDE,WORK1,WORK2,
     &                   WORK3,WORK4)
C          THIS SUBROUTINE CONTROLS THE IMPLICIT IN ETA STEPS.
      REAL    MUJ,MJLP1,MJLM1
      REAL    MNLM1,MNLP1
      REAL    MU,MUKM1,MUKP1,MULM1,MULP1,ME
      REAL    MINF
      LOGICAL SUBSON,SUBP1
      LOGICAL LINL
      LEVEL 2,U,UJP1,UJM1,V,VJP1,VJM1,W,WJP1,WJM1,P,PJP1,PJM1,
     &        H,HJP1,HJM1,ZI,ZIJP1,ZIJM1,
     &        DELU,DELV,DELW,DELP,DELH,DELZI,
     &        A,B,C,F,WORK1
      DIMENSION U(NK,NL),V(NK,NL),W(NK,NL),H(NK,NL),P(NK,NL),ZI(NK,NL),
     &          UJP1(NK,NL),VJP1(NK,NL),WJP1(NK,NL),HJP1(NK,NL),
     &          PJP1(NK,NL),ZIJP1(NK,NL),
     &          UJM1(NK,NL),VJM1(NK,NL),WJM1(NK,NL),HJM1(NK,NL),
     &          PJM1(NK,NL),ZIJM1(NK,NL),
     &          VB(NJ,NL),HB(NJ,NL),
     &          ET(NK),FI(NL),X(NJ)
      DIMENSION DELU(NK),DELV(NK),DELW(NK),DELH(NK),DELP(NK),DELZI(NK)
      DIMENSION INETFI(NL)
      DIMENSION A(6,6,NK),B(6,6,NK),C(6,6,NK),F(6,NK)
      DIMENSION DEL(NKM16),RTSIDE(NKM16)
      DIMENSION WORK1(1),WORK2(1),WORK3(1),WORK4(1)
      COMMON DCDE,DCDF,DCHKM1,DCH,DCHKP1,DDHLM1,DDULM1,DDVLM1,
     &       DDWLM1,DF,DHDE,DHDF,DMDE,DMDF,DMHKM1,DMH,DMHKP1,
     &       DPDE,DPDF,DPDX,DRHKM1,DRH,DRHKP1,DRPKM1,DRP,DRPKP1,
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     &        DRUE,DRUHE,DRUHRE,DRUHRX,DRURE,DRURX,DRUUE,DRUURE,
     &        DRUURX,DRUVE,DRUVRE,DRUVRX,DRUWRE,DRUWRX,DRVE,DRVHE,
     &        DRVHRE,DRVRE,DRVVE,DRVVRE,DRVWRE,DRWE,DRWF,DRWHE,
     &        DRWHF,DRWUE,DRWUF,DRWVE,DRWVF,DRWWE,DRWWF,DUDE,DUDF,
     &        DVDE,DVDF,DWDE,DWDF,DZIDF,DZIDX,D2HDE,D2HDEF,D2HDF,
     &        D2UDE,D2UDEF,D2UDF,D2VDE,D2VDEF,D2VDF,D2WDE,D2WDEF,
     &        D2WDF,D2ZIDF
      COMMON DHDX  ,DRODX ,DUDX  ,DVDX  ,DWDX  ,DRDDE ,DRDDF
      COMMON ALPHA1,ALPHA2,ALPHA3,GAMMA1,GAMMA2,GAMMA3,
     &        BETA2,EPS2,
     &        RKM1,R,RKP1,RJP1,RHOKM1,RHO,RHOKP1,CON,MU,PHI
      COMMON SUBSCN,SUBP1
      COMMON KM1,K,KP1
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,
     &         MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1
      COMMON /ITRATE/ ITER
      COMMON /QZBODY/ QZ1,QZ2,QZ3,QZ4,QZ5,QZ6
     &     ,QZ33,QZ42
      EQUIVALENCE (DF,DFIL)
      DATA LFLAG/-1/
C          LFLAG DETERMINES WHETHER L GOES FROM 1 TO NL OR FROM NL TO 1.
      LFLAG=-LFLAG
      L=0
      IF (LFLAG.EQ.-1)  L=NL+1
      IF (NL.NE.1)  DFILP1=FI(L+LFLAG+LFLAG)-FI(L+LFLAG)
      DO 200 LDUM=1,NL
      ISOLV = 0
      L=L+LFLAG
      LM1=L-LFLAG
      LP1=L+LFLAG
      LINL = .FALSE.
      IF ((L.NE.1 .AND. L.NE.NL) .OR. NL.EQ.1)  LINL = .TRUE.
C          OBTAIN THE COEFFICIENTS FOR THE FI DERIVATIVES.
      IF (L.NE.1.AND.L.NE.NL)  GO TO 30
C          IF L = 1 OR NL THEN ALL PHI DERIVATIVES EXCEPT THOSE
C          INVOLVING W AND THE SECOND DERIVATIVES MUST BE ZERO.
C          DEFINE PARAMETERS SO THAT THIS HAPPENS AND SO THAT THERE
C          ARE NO PROBLEMS WITH SUBSCRIPTS OR DIVISION BY ZERO.
C          WHEN NL.NE.1 AND L=1 OR NL THEN LP1 IS USED IN OBTAINING
C          THE NONZERO PHI DERIVATIVES.  LM1 IS SET TO 1 AND IS NOT
C          INVOLVED WITH NONZERO TERMS.  LP1 MUST BE DEFINED PROPERLY.
      LM1=1
      LP1=1
```

```
      IF (NL.NE.1.AND.L.EQ.1)  LP1=L+1
      IF (NL.NE.1.AND.L.EQ.NL)  LP1=L-1
C          SET DFIL (= DELTA PHI) SO THAT CROSS DERIVATIVE TERMS ARE
C          HANDLED PROPERLY IN SETUPE.
      DFIL = 1.E+60
      BETA1=0.
      BETA2=0.
      BETA3=0.
      EPS1=0.
      EPS2=0.
      EPS3=0.
      IF (NL.EQ.1)  GO TO 40
      RDFIL = 1. / (FI(LP1)-FI(L))
      RDFS2 = 2.*RDFIL*RDFIL
      GO TO 40
   30 CONTINUE
      DFIL=DFILP1
      DFILP1=FI(LP1)-FI(L)
      RD2FIL=2./(FI(LP1)-FI(LM1))
      EPS1=RD2FIL/DFIL
      EPS3=RD2FIL/DFILP1
      EPS2=-EPS1-EPS3
      BETA1=-DFILP1*EPS1*.5
      BETA3=DFIL*EPS3*.5
      BETA2=-BETA1-BETA3
   40 CONTINUE
      IF (INETFI(L) .EQ. 0)  GO TO 127
      INETFI(L) = 0
C          OBTAIN THE STARTING VALUES OF THE PARAMETERS.
      DETKP1=ET(2)-ET(1)
      R=XJP1*SINTC+ET(1)*ZIJP1(1,L)*COSTC
      RKP1=XJP1*SINTC+ET(2)*ZIJP1(2,L)*COSTC
      CALL PROP (HJP1(1,L),PJP1(1,L),RHO,DRP,DRH,
     &           MU,DMH,CON,DCH)
      CALL PROP (HJP1(2,L),PJP1(2,L),RHOKP1,DRPKP1,
     &           DRHKP1,MUKP1,DMHKP1,CONKP1,DCHKP1)
C          THIS IS THE ETA LOOP FOR A SPECIFIC VALUE OF FI.
C          THE LIMITS ARE FROM 2 TO NK-1 SINCE THE BOUNDARY CONDITIONS
C          (K=1 AT THE BODY, K=NK AT THE SHOCK) ARE HANDLED
C          SEPARATELY.
      DO 100 K=2,NKM1
      KM1=K-1
      KP1=K+1
C          OBTAIN THE COEFFICIENTS FOR THE ETA DERIVATIVES.
```

```
      DETK=DETKP1                                                       04410
      DETKP1=ET(KP1)-ET(K)                                              04420
      RD2ETK=2./(ET(KP1)-ET(KM1))                                       04430
      GAMMA1=RD2ETK/DETK                                                04440
      GAMMA3=RD2ETK/DETKP1                                              04450
      GAMMA2=-GAMMA1-GAMMA3                                             04460
      ALPHA1=-DETKP1*GAMMA1*.5                                          04470
      ALPHA3=DETK*GAMMA3*.5                                             04480
      ALPHA2=-ALPHA1-ALPHA3                                             04490
C          OBTAIN THE NEEDED PARAMETERS.                                04500
C**********THE CONDITION DP/DETA=0 CAN BE INVOKED BY SETTING************ 04510
C**********SUBSON = .TRUE. , IT IS SUPRESSED WHEN SUBSON = .FALSE. ***** 04520
      SUBSON = .FALSE.                                                  04530
C**********SET SUBP1 = .TRUE. IF DP/DX IS TO BE EVALUATED EXPLICITLY**** 04540
C**********OR SET TO ZERO.  FOR DP/DX IMPLICIT SET SUBP1 = .FALSE. ***** 04550
      SUBP1  = .TRUE.                                                   04560
      RKM1=R                                                            04570
      R=RKP1                                                            04580
      RJM1=XJ*SINTC+ET(K)*ZI(K,L)*COSTC                                 04590
      RKP1=XJP1*SINTC+ET(KP1)*ZIJP1(KP1,L)*COSTC                        04600
      RHOKM1=RHO                                                        04610
      RHO=RHOKP1                                                        04620
      CONKM1=CON                                                        04630
      CON=CONKP1                                                        04640
      MUKM1=MU                                                          04650
      MU=MUKP1                                                          04660
      DCHKM1=DCH                                                        04670
      DCH=DCHKP1                                                        04680
      DMHKM1=DMH                                                        04690
      DMH=DMHKP1                                                        04700
      DRHKM1=DRH                                                        04710
      DRH=DRHKP1                                                        04720
      DRPKM1=DRP                                                        04730
      DRP=DRPKP1                                                        04740
      CALL PROP (HJP1(KP1,L),PJP1(KP1,L),RHOKP1,                        04750
     &           DRPKP1,DRHKP1,MUKP1,DMHKP1,CONKP1,DCHKP1)              04760
      CALL PROP (H(K,L),P(K,L),RHOJM1,DZ1,DZ2,MUJ,DZ3,CONJ,DZ4)         04770
      CALL PROP (HJP1(K,LM1),PJP1(K,LM1),RHNLM1,DZ1,DZ2,MNLM1,DZ3,CNLM1, 04780
     &           DZ4)                                                   04790
      CALL PROP (HJP1(K,LP1),PJP1(K,LP1),RHNLP1,DZ1,DZ2,MNLP1,DZ3,CNLP1, 04800
     &           DZ4)                                                   04810
C          COMPUTE SOME TERMS COMMON TO MANY OF THE DERIVATIVE          04820
C          EXPRESSIONS.                                                 04830
      QZ1=ALPHA1*RHOKM1                                                 04840
```

```
      QZ2=ALPHA2*RHO
      QZ3=ALPHA3*RHOKP1
      QZ4=QZ1*UJP1(KM1,L)
      QZ5=QZ2*UJP1(K,L)
      QZ6=QZ3*UJP1(KP1,L)
      QZ7=QZ1*VJP1(KM1,L)
      QZ8=QZ2*VJP1(K,L)
      QZ9=QZ3*VJP1(KP1,L)
      QZ10=QZ1*WJP1(KM1,L)
      QZ11=QZ2*WJP1(K,L)
      QZ12=QZ3*WJP1(KP1,L)
C          COMPUTE THE DERIVATIVES.
      DHDX=(HJP1(K,L)-H(K,L))/DX
      DRODE = ALPHA1*RHOKM1 +ALPHA2*RHO     +ALPHA3*RHOKP1
      DRODF = BETA1*RHNLM1 +BETA2*RHO     +BETA3*RHNLP1
      DRODX=(RHO-RHOJM1          )/DX
      DUDX=(UJP1(K,L)-U(K,L))/DX
      DVDX=(VJP1(K,L)-V(K,L))/DX
      DWDX=(WJP1(K,L)-W(K,L))/DX
      DCDE=ALPHA1*CONKM1+ALPHA2*CON+ALPHA3*CONKP1
      DCDF=BETA1*CNLM1+BETA2*CON +BETA3*CNLP1
      DDHLM1=0.
      DDULM1=0.
      DDVLM1=0.
      DDWLM1=0.
      DHDE=ALPHA1*HJP1(KM1,L)+ALPHA2*HJP1(K,L)+ALPHA3*HJP1(KP1,L)
      DHDF=BETA1*H(K,LM1)+BETA2*H(K,L)+BETA3*H(K,LP1)
      DMDE=ALPHA1*MUKM1+ALPHA2*MU+ALPHA3*MUKP1
      DMDF=BETA1*MNLM1+BETA2*MU +BETA3*MNLP1
      DPDE=ALPHA1*PJP1(KM1,L)+ALPHA2*PJP1(K,L)+ALPHA3*PJP1(KP1,L)
      DPDF=BETA1*PJP1(K,LM1)+BETA2*PJP1(K,L)+BETA3*PJP1(K,LP1)
      DPDX=(PJP1(K,L)-P(K,L))/DX
      IF (SUBP1)  DPDX = (P(K,L) - PJM1(K,L)) / DXJM1
C**********TO SET DP/DX TO ZERO INSERT    DPDX = 0.    HERE.************
      DRUE=QZ4+QZ5+QZ6
      DRUHE=QZ4*HJP1(KM1,L)+QZ5*HJP1(K,L)+QZ6*HJP1(KP1,L)
      DRUHRE=QZ4*HJP1(KM1,L)*RKM1+QZ5*HJP1(K,L)*R+QZ6*HJP1(KP1,L)*RKP1
      DRUHRX=(RHO*UJP1(K,L)*HJP1(K,L)*R-RHOJM1*U(K,L)*H(K,L)*RJM1)/DX
      DRURE=QZ4*RKM1+QZ5*R+QZ6*RKP1
      DRURX=(RHO*UJP1(K,L)*R-RHOJM1*U(K,L)*RJM1)/DX
      DRUUE=QZ4*UJP1(KM1,L)+QZ5*UJP1(K,L)+QZ6*UJP1(KP1,L)
      DRUURE=QZ4*UJP1(KM1,L)*RKM1+QZ5*UJP1(K,L)*R+QZ6*UJP1(KP1,L)*RKP1
      DRUURX=(RHO*UJP1(K,L)*UJP1(K,L)*R-RHOJM1*U(K,L)*U(K,L)*RJM1)/DX
      DRUVE=QZ4*VJP1(KM1,L)+QZ5*VJP1(K,L)+QZ6*VJP1(KP1,L)
```

```
      DRUVRE=QZ4*VJP1(KM1,L)*RKM1+QZ5*VJP1(K,L)*R+CZ6*VJP1(KP1,L)*RKP1
      DRUVRX=(RHO*UJP1(K,L)*VJP1(K,L)*R-RHOJM1*U(K,L)*V(K,L)*RJM1)/DX
      DRUWRE=QZ4*WJP1(KM1,L)*RKM1+QZ5*WJP1(K,L)*R+CZ6*WJP1(KP1,L)*RKP1
      DRUWRX=(RHO*UJP1(K,L)*WJP1(K,L)*R-RHOJM1*U(K,L)*W(K,L)*RJM1)/DX
      DRVE=QZ7+QZ8+QZ9
      DRVHE=QZ7*HJP1(KM1,L)+QZ8*HJP1(K,L)+QZ9*HJP1(KP1,L)
      DRVHRE=QZ7*HJP1(KM1,L)*RKM1+QZ8*HJP1(K,L)*R+CZ9*HJP1(KP1,L)*RKP1
      DRVRE=QZ7*RKM1+QZ8*R+QZ9*RKP1
      DRVVE=QZ7*VJP1(KM1,L)+QZ8*VJP1(K,L)+QZ9*VJP1(KP1,L)
      DRVVRE=QZ7*VJP1(KM1,L)*RKM1+QZ8*VJP1(K,L)*R+CZ9*VJP1(KP1,L)*RKP1
      DRVWRE=QZ7*WJP1(KM1,L)*RKM1+QZ8*WJP1(K,L)*R+CZ9*WJP1(KP1,L)*RKP1
      DRWE=QZ10+QZ11+QZ12
      DRWHE=QZ10*HJP1(KM1,L)+QZ11*HJP1(K,L)+QZ12*HJP1(KP1,L)
      DRWUE=QZ4*WJP1(KM1,L)+QZ5*WJP1(K,L)+QZ6*WJP1(KP1,L)
      DRWVE=QZ7*WJP1(KM1,L)+QZ8*WJP1(K,L)+QZ9*WJP1(KP1,L)
      DRWWE=QZ10*WJP1(KM1,L)+QZ11*WJP1(K,L)+QZ12*WJP1(KP1,L)
      DUDE=ALPHA1*UJP1(KM1,L)+ALPHA2*UJP1(K,L)+ALPHA3*UJP1(KP1,L)
      DUDF=BETA1*UJP1(K,LM1)+BETA2*UJP1(K,L)+BETA3*UJP1(K,LP1)
      DVDE=ALPHA1*VJP1(KM1,L)+ALPHA2*VJP1(K,L)+ALPHA3*VJP1(KP1,L)
      DVDF=BETA1*VJP1(K,LM1)+BETA2*VJP1(K,L)+BETA3*VJP1(K,LP1)
      DWDE=ALPHA1*WJP1(KM1,L)+ALPHA2*WJP1(K,L)+ALPHA3*WJP1(KP1,L)
      DZIDF=BETA1*ZIJP1(K,LM1)+BETA2*ZIJP1(K,L)+BETA3*ZIJP1(K,LP1)
      DZIDX=(ZIJP1(K,L)-ZI(K,L))/DX
      D2HDE=GAMMA1*HJP1(KM1,L)+GAMMA2*HJP1(K,L)+GAMMA3*HJP1(KP1,L)
      D2UDE=GAMMA1*UJP1(KM1,L)+GAMMA2*UJP1(K,L)+GAMMA3*UJP1(KP1,L)
      D2VDE=GAMMA1*VJP1(KM1,L)+GAMMA2*VJP1(K,L)+GAMMA3*VJP1(KP1,L)
      D2WDE=GAMMA1*WJP1(KM1,L)+GAMMA2*WJP1(K,L)+GAMMA3*WJP1(KP1,L)
      IF (LINL)  GO TO 75
C        IF L = 1 OR NL AND THIS IS A NONZERO ANGLE OF ATTACK PROBLEM
C        THEN THE W DERIVATIVES AND SECOND DERIVATIVES WITH RESPECT
C        TO PHI ARE OBTAINED FROM ASSYMETRY OF W AND SYMMETRY OF THE
C        OTHER FUNCTIONS.
      DWDF=WJP1(K,LP1)*RDFIL
      DRWF=RHNLP1*DWDF
      DRWHF=HJP1(K,LP1)*DRWF
      DRWUF=UJP1(K,LP1)*DRWF
      DRWVF=VJP1(K,LP1)*DRWF
      DRWWF=0.
      D2HDEF=0.
      D2HDF=RDFS2*(HJP1(K,LP1)-HJP1(K,L))
      D2UDEF=0.
      D2UDF=RDFS2*(UJP1(K,LP1)-UJP1(K,L))
      D2VDEF=0.
      D2VDF=RDFS2*(VJP1(K,LP1)-VJP1(K,L))
```

```
      D2WDEF=(ALPHA1*WJP1(KM1,LP1)+ALPHA2*WJP1(K,LP1)
     &                            +ALPHA3*WJP1(KP1,LP1))*RCFIL
      D2WDF=0.
      D2ZIDF=RDFS2*(ZIJP1(K,LP1)-ZIJP1(K,L))
      GO TO 85
   75 CONTINUE
C          IF L DOES NOT = 1 OR NC THEN EVALUATE W-CERIVATIVES ANC
C          CROSS DERIVATIVES STANDARDLY.
      QZ13=BETA1*RHNLM1*WJP1(K,LM1)
      QZ14=BETA2*RHO *WJP1(K,L)
      QZ15=BETA3*RHNLP1*WJP1(K,LP1)
      DRWF=QZ13+QZ14+QZ15
      DRWHF=QZ13*HJP1(K,LM1)+QZ14*HJP1(K,L)+QZ15*HJP1(K,LP1)
      DRWUF=QZ13*UJP1(K,LM1)+QZ14*UJP1(K,L)+QZ15*UJP1(K,LP1)
      DRWVF=QZ13*VJP1(K,LM1)+QZ14*VJP1(K,L)+QZ15*VJP1(K,LP1)
      DRWWF=QZ13*WJP1(K,LM1)+QZ14*WJP1(K,L)+QZ15*WJP1(K,LP1)
      DWDF=BETA1*WJP1(K,LM1)+BETA2*WJP1(K,L)+BETA3*WJP1(K,LP1)
      D2HDEF=BETA1*(ALPHA1*HJP1(KM1,LM1)+ALPHA2*HJP1(K,LM1)
     &                            +ALPHA3*HJP1(KP1,LM1))
     &      +BETA2*(ALPHA1*HJP1(KM1,L)+ALPHA2*HJP1(K,L)
     &                           +ALPHA3*HJP1(KP1,L))
     &      +BETA3*(ALPHA1*HJP1(KM1,LP1)+ALPHA2*HJP1(K,LP1)
     &                            +ALPHA3*HJP1(KP1,LP1))
      D2HDF=EPS1*HJP1(K,LM1)+EPS2*HJP1(K,L)+EPS3*HJP1(K,LP1)
      D2UDEF=BETA1*(ALPHA1*UJP1(KM1,LM1)+ALPHA2*UJP1(K,LM1)
     &                            +ALPHA3*UJP1(KP1,LM1))
     &      +BETA2*(ALPHA1*UJP1(KM1,L)+ALPHA2*UJP1(K,L)
     &                           +ALPHA3*UJP1(KP1,L))
     &      +BETA3*(ALPHA1*UJP1(KM1,LP1)+ALPHA2*UJP1(K,LP1)
     &                            +ALPHA3*UJP1(KP1,LP1))
      D2UDF=EPS1*UJP1(K,LM1)+EPS2*UJP1(K,L)+EPS3*UJP1(K,LP1)
      D2VDEF=BETA1*(ALPHA1*VJP1(KM1,LM1)+ALPHA2*VJP1(K,LM1)
     &                            +ALPHA3*VJP1(KP1,LM1))
     &      +BETA2*(ALPHA1*VJP1(KM1,L)+ALPHA2*VJP1(K,L)
     &                           +ALPHA3*VJP1(KP1,L))
     &      +BETA3*(ALPHA1*VJP1(KM1,LP1)+ALPHA2*VJP1(K,LP1)
     &                            +ALPHA3*VJP1(KP1,LP1))
      D2VDF=EPS1*VJP1(K,LM1)+EPS2*VJP1(K,L)+EPS3*VJP1(K,LP1)
      D2WDEF=BETA1*(ALPHA1*WJP1(KM1,LM1)+ALPHA2*WJP1(K,LM1)
     &                            +ALPHA3*WJP1(KP1,LM1))
     &      +BETA2*(ALPHA1*WJP1(KM1,L)+ALPHA2*WJP1(K,L)
     &                           +ALPHA3*WJP1(KP1,L))
     &      +BETA3*(ALPHA1*WJP1(KM1,LP1)+ALPHA2*WJP1(K,LP1)
     &                            +ALPHA3*WJP1(KP1,LP1))
```

```
      D2WDF=EPS1*WJP1(K,LM1)+EPS2*WJP1(K,L)+EPS3*WJP1(K,LP1)
      D2ZIDF=EPS1*ZIJP1(K,LM1)+EPS2*ZIJP1(K,L)+EPS3*ZIJP1(K,LP1)
   85 CONTINUE
C           CALL THE SUBROUTINE THAT SETS UP THE MATRIX ELEMENTS
C           FOR EACH VALUE OF K.
      CALL SETUPE (NK,NKM1,UJP1(1,L),VJP1(1,L),WJP1(1,L),FJP1(1,L),
     &             PJP1(1,L),ZIJP1(1,L),
     &             ET,A,B,C,F)
C           CHECK FOR CONVERGENCE.
      SUMF = F(1,K)*F(1,K) + F(2,K)*F(2,K) + F(3,K)*F(3,K)
     &  + F(4,K)*F(4,K) + F(5,K)*F(5,K) + F(6,K)*F(6,K)
      IF (SUMF .GT. 6.E-17)  ISOLV = ISOLV + 1
      IF (SUMF .LT. 6.E-14)  GO TO 95
      INETFI(L) = 1
      IF (ITER.NE.-1)  ITER = 1
   95 CONTINUE
  100 CONTINUE
C           OBTAIN THE PARAMETERS AND DERIVATIVES NEEDED IN THE
C           SHOCK BOUNDARY CONDITION EQUATIONS.
      ALPHA2=1./(ET(NK)-ET(NKM1))
      ALPHA1=-ALPHA2
      PHI=FI(L)
      RKM1=R
      R=RKP1
      RJM1=XJ*SINTC+ET(NK)*ZI(NK,L)*COSTC
      RHOKM1=RHO
      RHO=RHOKP1
      CALL PROPRO (H(NK,L),P(NK,L),RHOJM1,DZ1,DZ2,DZ3,DZ4,DZ5,DZ6)
      CALL PROPRO (HJP1(NK,LM1),PJP1(NK,LM1),RHNLM1,DZ1,DZ2,DZ3,DZ4,DZ5,
     &                    DZ6)
      CALL PROPRO (HJP1(NK,LP1),PJP1(NK,LP1),RHNLP1,DZ1,DZ2,DZ3,DZ4,DZ5,
     &                    DZ6)
      DRHKM1=DRH
      DRH=DRHKP1
      DRPKM1=DRP
      DRP=DRPKP1
      DZIDX=(ZIJP1(NK,L)-ZI(NK,L))/DX
      DZIDF=BETA1*ZIJP1(NK,LM1)+BETA2*ZIJP1(NK,L)+BETA3*ZIJP1(NK,LP1)
      QZ1=ALPHA1*RHOKM1
      QZ2=ALPHA2*RHO
      QZ4=QZ1*UJP1(NKM1,L)
      QZ5=QZ2*UJP1(NK,L)
      QZ7=QZ1*VJP1(NKM1,L)
      QZ8=QZ2*VJP1(NK,L)
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      DRUE=QZ4+QZ5                                                      06610
      DRURE=QZ4*RKM1+QZ5*R                                              06620
      DRURX=(RHO*UJP1(NK,L)*R-RHOJM1*U(NK,L)*RJM1)/DX                   06630
      DRVE=QZ7+QZ8                                                      06640
      DRVRE=QZ7*RKM1+QZ8*R                                              06650
      DRWE=QZ1*WJP1(NKM1,L)+QZ2*WJP1(NK,L)                              06660
      DRWF=BETA1*RHNLM1*WJP1(NK,LM1)+BETA2*RHO *WJP1(NK,L)              06670
     &     +BETA3*RHNLP1*WJP1(NK,LP1)                                   06680
      IF ((L.EQ.1.OR.L.EQ.NL).AND.NL.NE.1)                              06690
     &                  DRWF=RHNLP1*WJP1(NK,LP1)/(FI(LP1)-FI(L))        06700
      DRODE = ALPHA1*RHOKM1 +ALPHA2*RHO                                 06710
      DRODF = BETA1*RHNLM1 *BETA2*RHO     +BETA3*RHNLP1                 06720
      DRODX=(RHO-RHOJM1          )/DX                                   06730
      DUDX=(UJP1(NK,L)-U(NK,L))/DX                                      06740
      DUDE = ALPHA1*UJP1(NKM1,L)+ALPHA2*UJP1(NK,L)                      06750
      DVDE = ALPHA1*VJP1(NKM1,L)+ALPHA2*VJP1(NK,L)                      06760
      DWDE = ALPHA1*WJP1(NKM1,L)+ALPHA2*WJP1(NK,L)                      06770
      DWDF = BETA1*WJP1(NK,LM1)+BETA2*WJP1(NK,L)+BETA3*WJP1(NK,LP1)     06780
      IF ((L.EQ.1.OR.L.EQ.NL).AND.NL.NE.1)                              06790
     &                          DWDF=WJP1(NK,LP1)/(FI(LP1)-FI(L))       06800
C          OBTAIN THE COEFFICIENTS FOR THE SHOCK BOUNDARY               06810
C          CONDITION EQUATIONS.                                         06820
      CALL SHOKBC (NK,NKM1,UJP1(1,L),VJP1(1,L),WJP1(1,L),HJP1(1,L),     06830
     &             PJP1(1,L),ZIJP1(1,L),                                06840
     &             ET,A,B,C,F)                                          06850
C          OBTAIN THE PARAMETERS AND DERIVATIVES NEEDED IN THE          06860
C          BODY BOUNDARY CONDITION EQUATIONS.                           06870
      R=XJP1*SINTC                                                      06880
      RKP1=R+ET(2)*ZIJP1(2,L)*COSTC                                     06890
      RJP1=XJP1*SINTC                                                   06900
      CALL PROP (HJP1(1,L),PJP1(1,L),RHO,DRP,DRH,                       06910
     &           MU,DMH,CON,DCH)                                        06920
      CALL PROP (HJP1(2,L),PJP1(2,L),RHOKP1,DRPKP1,                     06930
     &           DRHKP1,MUKP1,DMHKP1,CONKP1,DCHKP1)                     06940
      VBJP1=VB(JP1,L)                                                   06950
      HBJP1=HB(JP1,L)                                                   06960
      RDET=1./(ET(2)-ET(1))                                             06970
      DMDE=(MUKP1-MU)*RDET                                              06980
      DPDX=(PJP1(1,L)-P(1,L))/DX                                        06990
      DUDE=UJP1(2,L)*RDET                                               07000
      D2UDE=2.*(DUDE-UJP1(3,L)/(ET(3)-ET(1)))/(ET(2)-ET(3))             07010
      DPDE = (PJP1(2,L)-PJP1(1,L))*RDET                                 07020
      IF (.NOT.LINL)  D2WDEF = WJP1(2,LP1)*RDET*RDFIL                   07030
      IF (LINL)  D2WDEF =                                               07040
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```
     &   (BETA1*WJP1(2,LM1)+BETA2*WJP1(2,L)+BETA3*WJP1(2,LP1))*RDET
      DWDE = WJP1(2,L)*RDET
      DZIDE = BETA1*ZIJP1(1,LM1)+BETA2*ZIJP1(1,L)+BETA3*ZIJP1(1,LP1)
      D2VDE = 2.*VJP1(2,L)*RDET*RDET
C           OBTAIN THE COEFFICIENTS FOR THE BODY BOUNDARY
C           CONDITION EQUATIONS.
      CALL BODYBC (NK,UJP1(1,L),VJP1(1,L),WJP1(1,L),HJP1(1,L),PJP1(1,L),
     &             ZIJP1(1,L),
     &             ET,A,B,C,F,VBJP1,HBJP1)
C           CALL THE ROUTINE THAT COMPUTES THE INCREMENTS TO BE
C           ADDED TO THE SOLUTION AT X(J).
  127 CONTINUE
  147 CONTINUE
      IF (ISOLV.EQ.0)  GO TO 195
      CALL SOLVEQ (NK,NKM1,NKM16,6,A,B,C,F,DELU,DELV,DELW,DELH,DELP,
     &             DELZI,DEL,RTSIDE,WORK1,WORK2,WORK3,WORK4)
C           COMPUTE THE SOLUTION AT X(J+1).
      DO 150 K=2,NK
      UJP1(K,L)=UJP1(K,L)+DELU(K)
      VJP1(K,L)=VJP1(K,L)+DELV(K)
      WJP1(K,L)=WJP1(K,L)+DELW(K)
      HJP1(K,L)=HJP1(K,L)+DELH(K)
      IF (HJP1(K,L).LT.0.)  ITER=-1
      PJP1(K,L)=PJP1(K,L)+DELP(K)
      ZIJP1(K,L)=ZIJP1(K,L)+DELZI(K)
  150 CONTINUE
      ZIJP1(1,L)=ZIJP1(2,L)
  167 CONTINUE
      UJP1(1,L)=0.
      VJP1(1,L)=VBJP1
      WJP1(1,L)=0.
      HJP1(1,L)=HBJP1
C           THE VARIABLES QZ1-6 WERE COMPUTED IN SUBROUTINE BODYBC
C           AND PASSED THROUGH COMMON QZBODY.
      PJP1(1,L) = PJP1(1,L)+(DELZI(2)*QZ2+DELV(2)*QZ3+DELV(3)*QZ33
     &                 +DELP(2)*QZ4+DELW(2)*QZ42+QZ6)*QZI
  195 CONTINUE
  200 CONTINUE
      RETURN
      END
      SUBROUTINE BODYBC (NK,U,V,W,H,P,ZI,ET,A,B,C,F,VBJP1,HBJP1)
C           THIS SUBROUTINE MODIFIES THE COEFFICIENTS AT K=2 TO TAKE
C           INTO ACCOUNT THE BOUNDARY CONDITIONS AT THE BODY (K=1).
C           THE VALUES OF THE SUBSCRIPTS ON THE PARAMETERS ARE
```

```
C           WITH RESPECT TO K=1.
      REAL    MU,ME
      REAL    MINF
      LOGICAL SUBSON,SUBP1
      LEVEL 2,U,V,W,P,H,ZI,A,B,C,F
      DIMENSION U(NK),V(NK),W(NK),H(NK),P(NK),ZI(NK),ET(NK)
      DIMENSION A(6,6,NK),B(6,6,NK),C(6,6,NK),F(6,NK)
      COMMON DQ1(17),DPDE,DQ2(43),DWDE,DWDF,DZIDF,DQ3(7),D2VDE,DQ4(3),
     &        D2WDEF,DQ5(9)
      COMMON ALP(6),
     &        BETA2,EPS2,
     &        RKM1,R,RKP1,RJP1,RHOKM1,RHO,RHOKP1,CCN,MU,PHI
      COMMON SUBSON,SUBP1
      COMMON KM1,K,KP1
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,
     &          MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,U-BAR,SPROP
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1
      COMMON /QZBODY/ QZ1,QZ2,QZ3,QZ4,QZ5,QZ6
     &      ,QZ33,QZ42
      QZ7=VBJP1-V(1)
      QZ8=HBJP1-H(1)
      IF (VBJP1.EQ.0.)  GO TO 50
C           IF V AT THE CONE DOES NOT = 0, USE THE CONTINUITY EQUATION.
      QZ1=1./(DRP*VBJP1*RJP1)
      QZ2=RHOKP1*V(2)*ET(2)*COSTC
      QZ3=RHOKP1*RKP1
      QZ4=V(2)*RKP1*DRPKP1
      QZ5=V(2)*RKP1*DRHKP1
      QZ6=RHOKP1*V(2)*RKP1-VBJP1*RJP1*(RHO+DRH*QZ8)
      GO TO 75
   50 CONTINUE
C           IF V AT THE CONE = 0, USE THE V-MOMENTUM EQUATION.
      QZ1=1.
      QZ2=0.
      QZ3=0.
      QZ4=1.
      QZ5=0.
      QZ6=P(2)-P(1)
      QZ1 = (ET(2)-ET(1))/ZI(1)
      QZ2 = DPDE -RREINF*(MU/(3.*RJP1)*(D2WDEF-BETA2*DWDE))
      QZ3 = -RREINF*8.*MU/3./((ET(2)-ET(1))*(ET(2)-ET(1)))
      QZ33 = 0.
      QZ4 = ZI(1)/(ET(2)-ET(1))
      QZ42 =-RREINF*MU/(3.*RJP1)*(ZI(1)*BETA2-DZIDF)/(ET(2)-ET(1))
```

```
      QZ5 = 0.                                                          07930
      QZ6 = ZI(1)*DPDE-RREINF*(D2VDE*4.*MU/3.                           07940
     C                          +MU/(3.*RJP1)*(ZI(1)*D2WDEF-DZIDF*DWDE))  07950
   75 CONTINUE                                                          07960
      DO 100 I1=1,6                                                     07970
      QZ9=A(I1,5,2)*QZ1                                                 07980
      B(I1,1,2)=B(I1,1,2)+A(I1,1,2)+QZ9*QZ2                             07990
      B(I1,3,2)=B(I1,3,2)+QZ9*QZ3                                       08000
      B(I1,5,2)=B(I1,5,2)+QZ9*QZ4                                       08010
      B(I1,6,2)=B(I1,6,2)+QZ9*QZ5                                       08020
      B(I1,4,2) = B(I1,4,2)+QZ9*QZ42                                    08030
      C(I1,3,2) = C(I1,3,2)+QZ9*QZ33                                    08040
      F(I1,2)=F(I1,2)-QZ9*QZ6-A(I1,3,2)*QZ7-A(I1,6,2)*QZ8               08050
  100 CONTINUE                                                          08060
      DO 300 I1=1,6                                                     08070
      DO 200 I2=1,6                                                     08080
      A(I1,I2,2)=0.                                                     08090
  200 CONTINUE                                                          08100
  300 CONTINUE                                                          08110
      RETURN                                                            08120
      END                                                               08130
      SUBROUTINE SHOKBC (NK,NKM1,U,V,W,H,P,ZI,ET,A,B,C,F)               08140
C           THIS SUBROUTINE COMPUTES THE COEFFICIENTS FOR THE           08150
C           SHOCK BOUNDARY CONDITION EQUATIONS.                         08160
      LEVEL 2,U,V,W,H,P,ZI,A,B,C,F                                      08170
      REAL   MU,ME                                                      08180
      REAL   MINF                                                       08190
      LOGICAL SUBSON,SUBP1                                              08200
      DIMENSION U(NK),V(NK),W(NK),H(NK),P(NK),ZI(NK),ET(NK)             08210
      DIMENSION A(6,6,NK),B(6,6,NK),C(6,6,NK),F(6,NK)                   08220
      COMMON DQ1(20),DRHKM1,DRH,DRHKP1,DRPKM1,DRP,DRPKP1,               08230
     &       DRUE,DQ2(3),DRURE,DRURX,DQ3(8),DRVE,DRVHE,DRVHRE,          08240
     &       DRVRE,DQ4(3),DRWE,DRWF,DQ5(8),                             08250
     &       DUDE,DUDF,DVDE,DVDF,DWDE,                                  08260
     &       DWDF,DZIDF,DZIDX,DQ6(13)                                   08270
      COMMON DHDX   ,DRODX ,DUDX   ,DVDX   ,DWDX   ,DRODE ,DRODF       08280
      COMMON ALPHA1,ALPHA2,ALPHA3,GAMMA1,GAMMA2,GAMMA3,                 08290
     &       BETA2,EPS2,                                                08300
     &       RKM1,R,RKP1,RJP1,RHOKM1,RHO,RHOKP1,CON,MU,PHI              08310
      COMMON SUBSON,SUBP1                                               08320
      COMMON KM1,K,KP1                                                  08330
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,  08340
     &         MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP     08350
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1                      08360
```

```
      DO 200 I1=1,6
      DO 100 I2=1,6
      A(I1,I2,NK)=0.
      B(I1,I2,NK)=0.
      C(I1,I2,NK)=0.
  100 CONTINUE
  200 CONTINUE
      COSPHI=COS(PHI)
      UINF=CTCA-STSA*COSPHI
      VINF=-(STCA+CTSA*COSPHI)
      WINF=SINALF*SIN(PHI)
      QZ1=(RKM1*V(NKM1)-ET(NK)*(DZIDF*W(NKM1)+DZIDX*U(NKM1)*RKM1))
     &    *ALPHA1
      QZ2=R*U(NK)*ZI(NK)/DX+ALPHA2*(R*V(NK)-ET(NK)*(DZIDF*W(NK)
     &                                              +DZIDX*U(NK)*R))
      QZ3=U(NK)*U(NK)
      QZ4=V(NK)*V(NK)
      QZ5=W(NK)*W(NK)
      QZ6=U(NK)*UINF
      QZ7=V(NK)*VINF
      QZ8=W(NK)*WINF
      QZ9=QZ3+QZ4+QZ5
      QZ10=QZ6+QZ7+QZ8
      QZ11=QZ9-QZ10
      QZ12=UINF-U(NK)
      QZ13=VINF-V(NK)
      QZ14=WINF-W(NK)
      QZ15=(U(NK)*QZ12+V(NK)*QZ13+W(NK)*QZ14)**2
      QZ16=PINF-P(NK)
      A(1,1,NK)=ALPHA1*COSTC*RHOKM1*ET(NKM1)*(V(NKM1)
     &                                        -U(NKM1)*ET(NK)*DZIDX)
      A(1,2,NK)=-ALPHA1*RHOKM1*RKM1*ET(NK)*DZIDX
      A(1,3,NK)=ALPHA1*RHOKM1*RKM1
      A(1,4,NK)=-ALPHA1*RHOKM1*ET(NK)*DZIDF
      A(1,5,NK)=DRPKM1*QZ1
      A(1,6,NK)=DRHKM1*QZ1
      B(1,1,NK)=ET(NK)*(RHO*COSTC*(U(NK)*(ZI(NK)/DX-ET(NK)*ALPHA2*DZIDX)
     &                              +ALPHA2*V(NK))    -DRURE/DX)
     &          +DRWF+DRURX
      B(1,2,NK)=RHO*R*(ZI(NK)/DX-ET(NK)*ALPHA2*DZIDX)
      B(1,3,NK)=RHO*R*ALPHA2
      B(1,4,NK)=-ALPHA2*RHO*ET(NK)*DZIDF
      B(1,5,NK)=DRP*QZ2
      B(1,6,NK)=DRH*QZ2
```

```
      F(1,NK)=-DRVRE-ZI(NK)*DRWE+ET(NK)*DZIDF*DRWE
     &        -ZI(NK)*DRURX +ET(NK)*DZIDX*DRURE
      B(2,1,NK)=QZ13/DX
      B(2,2,NK)=-1.
      B(2,3,NK)=-DZIDX
      F(2,NK)=-QZ12
      B(4,1,NK)=QZ14*ET(NK)*COSTC
      B(4,3,NK)=-DZIDF
      B(4,4,NK)=-R
      F(4,NK)=-QZ13*DZIDF-QZ14*R
      B(5,2,NK)=2.*RHO*U(NK)-(RHO+1.)*UINF
      B(5,3,NK)=2.*RHO*V(NK)-(RHO+1.)*VINF
      B(5,4,NK)=2.*RHO*W(NK)-(RHO+1.)*WINF
      B(5,5,NK)=DRP*QZ11
      B(5,6,NK)=DRH*QZ11
      F(5,NK)=-RHO*QZ11-1.+QZ10
      B(6,2,NK)=ME*U(NK)
      B(6,3,NK)=ME*V(NK)
      B(6,4,NK)=ME*W(NK)
      B(6,5,NK)=1.
      F(6,NK)=-H(NK)-ME*QZ9/2.+HBAR
      B(3,2,NK)=RHO*(U(NK)*(6.*QZ6-4.*QZ9)+2.*(UINF*(CZ4+CZ5)
     &                                    +2.*U(NK)*(CZ7+CZ8)))
     &        +2.*(UINF*((1.-RHO)*QZ10-1.)-QZ16*CZ12)
      B(3,3,NK)=RHO*(V(NK)*(6.*QZ7-4.*QZ9)+2.*(VINF*(CZ3+CZ5)
     &                                    +2.*V(NK)*(CZ6+CZ8)))
     &        +2.*(VINF*((1.-RHO)*QZ10-1.)-QZ16*CZ13)
      B(3,4,NK)=RHO*(W(NK)*(6.*QZ8-4.*QZ9)+2.*(WINF*(CZ3+CZ4)
     &                                    +2.*W(NK)*(CZ6+CZ7)))
     &        +2.*(WINF*((1.-RHO)*QZ10-1.)-QZ16*CZ14)
      B(3,5,NK)=-DRP*QZ15-QZ9-1.+2.*QZ10
      B(3,6,NK)=-DRH*QZ15
      F(3,NK)=RHO*QZ15-(UINF*QZ12+VINF*QZ13+WINF*CZ14)**2
     &       -QZ16*(QZ12*QZ12+QZ13*QZ13+CZ14*CZ14)
      F(2,NK)=F(2,NK)-QZ13*DZIDX
      B(1,1,NK) = B(1,1,NK) - ET(NK)*DRWE*BETA2
      B(1,4,NK) = B(1,4,NK) + ZI(NK)*RHO*BETA2
      B(1,5,NK) = B(1,5,NK) + DRP*ZI(NK)*W(NK)*BETA2
      B(1,6,NK) = B(1,6,NK) + DRH*ZI(NK)*W(NK)*BETA2
      B(4,1,NK) = B(4,1,NK) + QZ13*BETA2
      RETURN
      END
      SUBROUTINE SETUPE (NK,NKM1,U,V,W,H,P,ZI,ET,A,B,C,F)
C          THIS SUBROUTINE SETS UP THE COEFFICINT MATRIX FOR THE
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| | | | | | |
|---|---|---|---|---|---|
| .18950E-02 | .98484E+00 | .54151E-01 | .38406E-02 | .24277E-01 | .14174E+01 |
| .20624E-02 | .98721E+00 | .55020E-01 | .47644E-02 | .23814E-01 | .12928E+01 |
| .22299E-02 | .98615E+00 | .54966E-01 | .65181E-02 | .23321E-01 | .12979E+01 |
| .23969E-02 | .98729E+00 | .55064E-01 | .84711E-02 | .22878E-01 | .12843E+01 |
| .25639E-02 | .98775E+00 | .55828E-01 | .10626E-01 | .22421E-01 | .12667E+01 |
| .27309E-02 | .98815E+00 | .56827E-01 | .12898E-01 | .21979E-01 | .12549E+01 |
| .28980E-02 | .98863E+00 | .57889E-01 | .15166E-01 | .21551E-01 | .12499E+01 |
| .30650E-02 | .98895E+00 | .59304E-01 | .17490E-01 | .21116E-01 | .12286E+01 |
| .32320E-02 | .98928E+00 | .61055E-01 | .19838E-01 | .20713E-01 | .12168E+01 |
| .33949E-02 | .98954E+00 | .62939E-01 | .22100E-01 | .20296E-01 | .12059E+01 |
| .35410E-02 | .98974E+00 | .64821E-01 | .24136E-01 | .19955E-01 | .11966E+01 |
| .36705E-02 | .98989E+00 | .66572E-01 | .25954E-01 | .19628E-01 | .11889E+01 |
| .37874E-02 | .99002E+00 | .68207E-01 | .27575E-01 | .19355E-01 | .11813E+01 |
| .38918E-02 | .99014E+00 | .69658E-01 | .29926E-01 | .19088E-01 | .11747E+01 |
| .39878E-02 | .99029E+00 | .70956E-01 | .30338E-01 | .18863E-01 | .11688E+01 |
| .40755E-02 | .99037E+00 | .72050E-01 | .31520E-01 | .18646E-01 | .11628E+01 |
| .41549E-02 | .99049E+00 | .72946E-01 | .32548E-01 | .18461E-01 | .11574E+01 |
| .42259E-02 | .99062E+00 | .73572E-01 | .33415E-01 | .18289E-01 | .11524E+01 |
| .42902E-02 | .99073E+00 | .74050E-01 | .34113E-01 | .18169E-01 | .11481E+01 |
| .43486E-02 | .99080E+00 | .74143E-01 | .34536E-01 | .18027E-01 | .11448E+01 |
| .44029E-02 | .99092E+00 | .74514E-01 | .34955E-01 | .18028E-01 | .11418E+01 |
| .44530E-02 | .99234E+00 | .67481E-01 | .35211E-01 | .16555E-01 | .11213E+01 |
| 0. | 0. | 0. | 0. | .25270E-01 | .55093E+01 |
| .16796E-04 | .12597E-01 | .14366E-04 | -.22789E-16 | .25288E-01 | .55741E+01 |
| .35272E-04 | .26295E-01 | .64953E-04 | -.47625E-16 | .25308E-01 | .56411E+01 |
| .55427E-04 | .41061E-01 | .15531E-03 | -.74483E-16 | .25307E-01 | .57094E+01 |
| .77682E-04 | .57165E-01 | .29919E-03 | -.10389E-15 | .25324E-01 | .57798E+01 |
| .10246E-03 | .74865E-01 | .50605E-03 | -.13636E-15 | .25328E-01 | .58498E+01 |
| .12975E-03 | .94109E-01 | .78983E-03 | -.17191E-15 | .25350E-01 | .59281E+01 |
| .15956E-03 | .11485E+00 | .11992E-02 | -.21056E-15 | .25350E-01 | .59879E+01 |
| .17594E-03 | .12612E+00 | .13860E-02 | -.23176E-15 | .25350E-01 | .60214E+01 |
| .19232E-03 | .13732E+00 | .16295E-02 | -.25297E-15 | .25362E-01 | .60523E+01 |
| .21037E-03 | .14997E+00 | .19151E-02 | -.27536E-15 | .25371E-01 | .60834E+01 |
| .22843E-03 | .16174E+00 | .22192E-02 | -.29986E-15 | .25374E-01 | .61116E+01 |
| .24832E-03 | .18833E+00 | .29466E-02 | -.35204E-15 | .25395E-01 | .61534E+01 |
| .31241E-03 | .21729E+00 | .38300E-02 | -.41069E-15 | .25392E-01 | .62031E+01 |
| .36112E-03 | .24879E+00 | .49030E-02 | -.47711E-15 | .25411E-01 | .62330E+01 |
| .41487E-03 | .28302E+00 | .61766E-02 | -.55341E-15 | .25401E-01 | .62429E+01 |
| .47487E-03 | .32014E+00 | .76606E-02 | -.64233E-15 | .25413E-01 | .62296E+01 |
| .53916E-03 | .36031E+00 | .93962E-02 | -.74793E-15 | .25394E-01 | .61800E+01 |
| .61516E-03 | .40646E+00 | .11507E-01 | -.88501E-15 | .25394E-01 | .61047E+01 |
| .69872E-03 | .45634E+00 | .13949E-01 | -.10589E-14 | .25337E-01 | .59724E+01 |
| .79118E-03 | .51854E+00 | .16734E-01 | -.12896E-14 | .25337E-01 | .57790E+01 |

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      QZ15=QZ12*RHOKP1*RKP1
      QZ16=-QZ12*ET(K)*RHOKP1*DZIDF
      QZ17=QZ12*(V(KP1)*RKP1-ET(K)*(DZIDF*W(KP1)+CZIDX*U(KP1)*RKP1))
      QZ18=R*R+ET(K)*DZIDF*ET(K)*DZIDF
      QZ19=DZIDF*DMDF
      QZ20=DZIDF*DUDF
      QZ21=2.*ET(K)*MU*DZIDF*(DZIDF-ZI(K)/DF)
     &     -ZI(K)*ET(K)*(MU*D2ZIDF+QZ19)
      QZ22=QZ21+ZI(K)*MU*R*COSTC
      QZ23=R*ZI(K)*(ZI(K)*(R*U(K)*V(K)/DX-W(K)*W(K)*COSTC)+QZ10A*V(K))
      QZ24=QZ18+R*R/3.
      QZ25=R
      QZ26=ZI(K)*(V(K)*COSTC+U(K)*(SINTC+R/DX))
      QZ27=R*ZI(K)*(QZ26+QZ10A)*W(K)
      QZ28=R*R+4.*ET(K)*DZIDF*ET(K)*DZIDF/3.
      QZ29=ET(K)*ZI(K)*COSTC-R/3.
      QZ30=(MU/DF-2.*DMDF)/3.
      QZ31=QZ21-ET(K)*DZIDF*ZI(K)*(MU/DF+DMDF)/3.
      QZ32=DWDE*QZ28-ET(K)*DZIDF*(4.*DWDF*ZI(K)+R*DVDE)/3.+R*ZI(K)*DVDF
      QZ33=ALPHA1*(RKM1*V(KM1)-ET(K)*(DZIDF*W(KM1)+RKM1*U(KM1)*CZIDX))
      QZ34=ALPHA2*(R*V(K)-ET(K)*(DZIDF*W(K)+R*U(K)*CZIDX))
     &            +R*U(K)*ZI(K)/DX
      QZ35=ALPHA3*(RKP1*V(KP1)-ET(K)*(DZIDF*W(KP1)+RKP1*U(KP1)*CZIDX))
      QZ36=R*ZI(K)*(R*U(K)*(ZI(K)/DX-ALPHA2*ET(K)*DZIDX)
     &            +ALPHA2*(V(K)*R-ET(K)*DZIDF*W(K)))
      QZ37=2.*MU*(QZ18*DUDE-ZI(K)*ET(K)*DZIDF*DUDF)
      QZ38=2.*MU*(QZ28*DWDE-ZI(K)*ET(K)*DZIDF*DWDF*4./3.)
      QZ39=DUDE*DUDE+DWDE*DWDE
      QZ40=DUDF*DUDF+DWDF*DWDF*4./3.
      QZ41=ET(K)*DZIDF*(DUDF*DUDE+DWDF*DWDE*4./3.)
      QZ42=QZ18*QZ39+ZI(K)*(ZI(K)*QZ40-2.*QZ41)
     &     +((ET(K)*DZIDF*DWDE)**2)/3.
C          THE SHOCK EQUATION
      A(1,1,K)=ALPHA1
      A(1,2,K)=0.
      A(1,3,K)=0.
      A(1,4,K)=0.
      A(1,5,K)=0.
      A(1,6,K)=0.
      B(1,1,K)=ALPHA2
      B(1,2,K)=0.
      B(1,3,K)=0.
      B(1,4,K)=0.
      B(1,5,K)=0.
```

```
      B(1,6,K)=0.
      C(1,1,K)=ALPHA3
      C(1,2,K)=0.
      C(1,3,K)=0.
      C(1,4,K)=0.
      C(1,5,K)=0.
      C(1,6,K)=0.
      F(1,K)=0.
C           THE U-MOMENTUM EQUATION
      A(2,1,K)=QZ1*U(KM1)
      A(2,2,K)=QZ0*RHOKM1*(V(KM1)*RKM1-ET(K)*W(KM1)*DZIDF)+QZ2*2.*U(KM1)
      A(2,3,K)=QZ3*U(KM1)
      A(2,4,K)=QZ4*U(KM1)
      A(2,5,K)=QZ5*U(KM1)*DRPKM1-QZ0*R*DZIDX*ET(K)
      A(2,6,K)=QZ5*U(KM1)*DRHKM1
      B(2,1,K)
     &       =ET(K)*ZI(K)*COSTC*(R*RHO*U(K)*(U(K)*ZI(K)/DX+ALPHA2*V(K)))
     &        +QZ6*(DRUVRE-ET(K)*DZIDF*DRWUE+2.*R*ZI(K)*CPDX)
     &        +QZ7*ZI(K)*(DRWUF-RHO*W(K)*W(K)*SINTC+DRUURX)
     &        -R*ET(K)*DPDE*(DZIDX*(R+2.*ET(K)*ZI(K)*COSTC)+ZI(K)*R/DX)
     &        -ET(K)*DRUURE*(DZIDX*QZ6+R*ZI(K)/DX)
     &        -QZ8*ET(K)*DZIDX*RHO*U(K)*U(K)*ET(K)*COSTC
      B(2,2,K)=QZ10*2.*U(K)+QZ8*RHO*(V(K)*R-ET(K)*W(K)*DZIDF)
      B(2,3,K)=QZ8*R*RHO*U(K)
      B(2,4,K)=-QZ9*(ALPHA2*ET(K)*U(K)*DZIDF+2.*ZI(K)*W(K)*SINTC)
      B(2,5,K)=DRP*QZ11+R*R*ZI(K)*(ZI(K)/DX-ALPHA2*ET(K)*DZIDX)
C           IF DP/DX IS EVALUATED EXPLICITLY OR SET TO ZERO REDEFINE B25K
      IF (SUBP1)
     &B(2,5,K)=DRP*QZ11+R*R*ZI(K)*(    0.    -ALPHA2*ET(K)*DZIDX)
      B(2,6,K)=DRH*QZ11
      C(2,1,K)=QZ13*U(KP1)
      C(2,2,K)=QZ12*RHOKP1*(V(KP1)*RKP1-ET(K)*W(KP1)*DZIDF)
     &          +QZ14*2.*U(KP1)
      C(2,3,K)=QZ15*U(KP1)
      C(2,4,K)=QZ16*U(KP1)
      C(2,5,K)=QZ17*U(KP1)*DRPKP1-QZ12*R*DZIDX*ET(K)
      C(2,6,K)=QZ17*U(KP1)*DRHKP1
      F(2,K)=-(-ZI(K)*SINTC*QZ9*W(K)*W(K)
     &       +ZI(K)*QZ25*(DRUVRE-ET(K)*DZIDF*DRWUE+ZI(K)*DRWUF))
      F(2,K)=F(2,K)-R*ZI(K)*(ZI(K)*(DRUURX+R*DPDX)
     &                      -ET(K)*DZIDX*(DRUURE+R*DPDE))
C           NOW THE VISCOUS TERMS
      A(2,2,K)=A(2,2,K)-((MU*GAMMA1+ALPHA1*DMDE)*QZ18+ALPHA1*QZ22)/REINF
      A(2,6,K)=A(2,6,K)-ALPHA1*DMHKM1*(DUDE*QZ18-ET(K)*ZI(K)*QZ20)/REINF
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```
      B(2,1,K)=B(2,1,K)-(COSTC*(DUDE*(MU*ZI(K)*ET(K)*COSTC
     &                          +R*(MU+2.*ET(K)*DMDE))
     &                     +2.*ET(K)*MU*R*D2UDE)
     &              -ET(K)*DZIDF*(DUDF*DMDE+DMDF* DUDE)
     &              -ET(K)*MU*(D2ZIDF*DUDE+2.*DZIDF*D2UDEF)
     &              +2.*ZI(K)*(MU*D2UDF+DUDF*DMDF))/REINF
      B(2,2,K)=B(2,2,K)-((MU*GAMMA2+ALPHA2*DMDE)*CZ18+ALPHA2*CZ22)/REINF
      B(2,6,K)=B(2,6,K)-DMH*((ALPHA2*DUDE+D2UDE)*CZ18
     &                  -ALPHA2*ET(K)*ZI(K)*CZ20
     &                  +DUDE*(R*ZI(K)*COSTC+ET(K)*(2.*DZIDF*DZIDF
     &                                          -ZI(K)*D2ZIDF))
     &                  +ZI(K)*ZI(K)*D2UDF-2.*ET(K)*ZI(K)*DZIDF*D2UDEF)
     &                  /REINF
      C(2,2,K)=C(2,2,K)-((MU*GAMMA3+ALPHA3*DMDE)*CZ18+ALPHA3*CZ22)/REINF
      C(2,6,K)=C(2,6,K)-ALPHA3*DMHKP1*(DUDE*CZ18-ET(K)*ZI(K)*CZ20)/REINF
      F(2,K)=F(2,K) +((DMDE*DUDE+MU*D2UDE)*CZ18
     &             +MU*ZI(K)*COSTC*DUDE*R
     &             -ET(K)*ZI(K)*DZIDF*(DMDF*DUDE+DUDF*DMDE)
     &             +2.*ET(K)*DZIDF*MU*(DZIDF*DUDE-ZI(K)*(D2UDEF
     &                                          -DDULM1/DF))
     &             +ZI(K)*ZI(K)*(DUDF*DMDF+MU*D2UDF)
     &             -ET(K)*ZI(K)*MU*D2ZIDF*DUDE)/REINF
C          THE V-MOMENTUM EQUATION
      A(3,1,K)=QZ1*V(KM1)
      A(3,2,K)=QZ2*V(KM1)
      A(3,3,K)=QZ0*RHOKM1*(2.*V(KM1)*RKM1-ET(K)*W(KM1)*DZIDF)+QZ2*U(KM1)
      A(3,4,K)=QZ4*V(KM1)
      A(3,5,K)=QZ5*V(KM1)*DRPKM1+R*QZ0
      A(3,6,K)=QZ5*V(KM1)*DRHKM1
      B(3,1,K)
     &       =ET(K)*ZI(K)*COSTC*(R*RHO*V(K)*(U(K)*ZI(K)/DX+ALPHA2*V(K)))
     &        +QZ6*(DRVVRE-ET(K)*DZIDF*DRWVE-ET(K)*DZIDX*DRUVRE)
     &        +QZ7*ZI(K)*(DRWVF-RHO*W(K)*W(K)*COSTC+DRUVRX)
     &        +R*DPDE*(R+2.*ET(K)*ZI(K)*COSTC)
     &        -R*ET(K)*ZI(K)*(DRUVRE/DX+DZIDX*ALPHA2*RHO*U(K)*V(K)*ET(K)
     &                                          *COSTC)
      B(3,2,K)=QZ9*V(K)*R*(ZI(K)/DX-ET(K)*ALPHA2*DZIDX)
      B(3,3,K)=QZ10*U(K)+QZ8*RHO*(2.*V(K)*R-ET(K)*W(K)*DZIDF)
      B(3,4,K)=-QZ9*(ALPHA2*ET(K)*V(K)*DZIDF+2.*ZI(K)*W(K)*COSTC)
      B(3,5,K)=DRP*QZ23+R*QZ8
      B(3,6,K)=DRH*QZ23
      C(3,1,K)=QZ13*V(KP1)
      C(3,2,K)=QZ14*V(KP1)
      C(3,3,K)=QZ12*RHOKP1*(2.*V(KP1)*RKP1-ET(K)*W(KP1)*DZIDF)
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```
&          +QZ14*U(KP1)
 C(3,4,K)=QZ16*V(KP1)
 C(3,5,K)=QZ17*V(KP1)*DPPXP1+R*QZ12
 C(3,6,K)=QZ17*V(KP1)*DRHKP1
 F(3,K)=-(R*R*ZI(K)*DPDE
&        +ZI(K)*QZ25*(DRVVRE-ET(K)*DZIDF*DRWVE
&                    +ZI(K)*(DRWVF-RHO*W(K)*W(K)*COSTC)))
 F(3,K)=F(3,K)-R*ZI(K)*(ZI(K)*DRUVRX-ET(K)*DZIDX*DRUVRE)
C      NOW THE VISCOUS TERMS
 A(3,3,K)=A(3,3,K)-((MU*GAMMA1+ALPHA1*DMDF)*CZ24+ALPHA1*QZ21)/REINF
 A(3,4,K)=A(3,4,K)-(-(2.*ZI(K)*ET(K)*COSTC+R)*MU*DZIDF*ALPHA1/3.
&               -(MU*GAMMA1+ALPHA1*DMDE)*R*ET(K)*DZIDF/3.
&               +(MU/(DF*3.)+DMDF)*QZ0)/REINF
 A(3,6,K)=A(3,6,K)-ALPHA1*DMHKM1*(DVDE*QZ24-ET(K)*ZI(K)*DZIDF*DVDF
&                          -R*(ZI(K)*DWDF*2.+ET(K)*DZIDF*DWDE)/3.)
&               /REINF
 B(3,1,K)=B(3,1,K)-(R*ET(K)*COSTC*8./3.*(DMDE*DVDE+MU*D2VDE)
&               -ET(K)*DZIDF*(DVDF*DMDE+DVDE*DMDF)
&               -ET(K)*MU*(D2ZIDF*DVDE+2.*DZIDF*D2VDEF)
&               +2.*ZI(K)*(MU*D2VDF+DVDF*DMDF)
&               -DZIDF*ET(K)*COSTC*(DWDE*(ET(K)*DMDE/3.+MU)
&                                  +ET(K)*MU*D2WDE/3.)
&               +MU*ZI(K)*COSTC*DWDF*4./3.
&               +QZ6*(DMDF*DWDE+MU*D2WDEF/3.-DWDF*DMDE*2./3.))/REINF
 B(3,3,K)=B(3,3,K)-((MU*GAMMA2+ALPHA2*DMDE)*CZ24+ALPHA2*CZ21)/REINF
 B(3,4,K)=B(3,4,K)-(ALPHA2*(R*(ZI(K)*(DMDF+MU/(DF*3.))
&                          -DZIDF*(MU+ET(K)*DMDE)/3.)
&                       -ET(K)*ZI(K)*COSTC*DZIDF*MU *2./3.)
&               -GAMMA2*R*ET(K)*DZIDF*MU /3.)/REINF
 B(3,6,K)=B(3,6,K)-DMH*((ALPHA2*DVDE+D2VDE)*CZ24
&                    -ALPHA2*ET(K)*ZI(K)*DZIDF*DVDF
&                    +DVDE*ET(K)*(2.*DZIDF*DZIDF-ZI(K)*D2ZIDF)
&                    +ZI(K)*ZI(K)*D2VDF-2.*ET(K)*ZI(K)*DZIDF*D2VDEF
&                    -DWDE*DZIDF*(2.*ET(K)*ZI(K)*COSTC
&                                 +R*(1.+ET(K)*ALPHA2))/3.
&                    +R*(D2WDEF*ZI(K)-D2WDE*ET(K)*DZIDF)/3.
&                    -DWDF*ZI(K)*(R*ALPHA2-ZI(K)*COSTC)*2./3.)/REINF
 C(3,3,K)=C(3,3,K)-((MU*GAMMA3+ALPHA3*DMDF)*CZ24+ALPHA3*QZ21)/REINF
 C(3,4,K)=C(3,4,K)-(-(2.*ZI(K)*ET(K)*COSTC+R)*MU*DZIDF*ALPHA3/3.
&               -(MU*GAMMA3+ALPHA3*DMDF)*R*ET(K)*DZIDF/3.
&               +(MU/(DF*3.)+DMDF)*QZ12)/REINF
 C(3,6,K)=C(3,6,K)-ALPHA3*DMHKP1*(DVDE*QZ24-ET(K)*ZI(K)*DZIDF*DVDF
&                          -R*(ZI(K)*DWDF*2.+ET(K)*DZIDF*DWDE)/3.)
&               /REINF
```

```
      F(3,K)=F(3,K)+((DMDE*DVDE+MU*D2VDE)*QZ24
     &            + R   *(ZI(K)*(DMDF*DWDE+(MU*D2WDEF-2.*DWDF*DMDE)/3.)
     &                  -DZIDF*(MU*DWDE+ET(K)*(DMDE*DWDE+MU*D2WDE))/3.)
     &            +ZI(K)*ZI(K)*(DMDF*DVDF+MU*D2VDF+MU*COSTC*DWDF*2./3.)
     &            +ET(K)*DZIDF*(ZI(K)*(2.*MU*(DDVLM1/DF-D2VDEF)
     &                                  -DMDF*DVDE-DVDF*DMDE)
     &                          +MU*2.*(DZIDF*DVDE-ZI(K)*COSTC*DWDE/3.))
     &            -MU*ZI(K)*(ET(K)*D2ZIDF*DVDE+R*DDWLM1/(3.*DF)))/REINF
C         THE W-MOMENTUM EQUATION
      A(4,1,K)=QZ1*W(KM1)
      A(4,2,K)=QZ2*W(KM1)
      A(4,3,K)=QZ3*W(KM1)
      A(4,4,K)=QZ0*RHOKM1*(V(KM1)*RKM1-2.*ET(K)*W(KM1)*DZIDF)+QZ2*U(KM1)
      A(4,5,K)=QZ5*W(KM1)*DRPKM1-QZ0*ET(K)*DZIDF
      A(4,6,K)=QZ5*W(KM1)*DRHKM1
      B(4,1,K)=R*ET(K)*ZI(K)*(RHO*W(K)*COSTC*(ZI(K)*U(K)/DX
     &                                  +ALPHA2*(V(K)-U(K)*ET(K)*DZIDX))
     &                    -DRVWRE/DX)
     &        +QZ6*(DRVWRE-ET(K)*(DZIDF*(DRWWE+DPDE)+DZIDX*DRUWRE))
     &        +QZ7*ZI(K)*(RHO*W(K)*(U(K)*SINTC+V(K)*COSTC)+DRWWF+DPDF
     &                  +DRUWRX)
      B(4,2,K)=QZ10*W(K)+QZ9*ZI(K)*W(K)*SINTC
      B(4,3,K)=QZ9*W(K)*(R*ALPHA2+ZI(K)*COSTC)
      B(4,4,K)=QZ9*(ALPHA2*(V(K)*R-ET(K)*(U(K)*R*DZIDX+2.*W(K)*DZIDF))
     &            +QZ26)
      B(4,5,K)=DRP*QZ27-ET(K)*DZIDF*QZ8
      B(4,6,K)=DRH*QZ27
      C(4,1,K)=QZ13*W(KP1)
      C(4,2,K)=QZ14*W(KP1)
      C(4,3,K)=QZ15*W(KP1)
      C(4,4,K)=QZ12*RHOKP1*(V(KP1)*RKP1-2.*ET(K)*W(KP1)*DZIDF)
     &        +QZ14*U(KP1)
      C(4,5,K)=QZ17*W(KP1)*DRPKP1-QZ12*ET(K)*DZIDF
      C(4,6,K)=QZ17*W(KP1)*DRHKP1
      F(4,K)=    -R*ZI(K)*(DRVWRE+ZI(K)*(DRWWF+DPDF+RHO*W(K)*(U(K)*SINTC
     &                                                  +V(K)*COSTC))
     &                    -ET(K)*DZIDF*(DPDE+DRWWE))
      F(4,K)=F(4,K)-R*ZI(K)*(ZI(K)*DRUWRX-ET(K)*DZIDX*DRUWRE)
C         NOW THE VISCOUS TERMS
      A(4,3,K)=A(4,3,K)-(DZIDF*(QZ29*ALPHA1*MU
     &                    -R*ET(K)*(GAMMA1*MU+ALPHA1*DMDE)/3.)
     &              +QZ0*QZ30)/REINF
      A(4,4,K)=A(4,4,K)-((MU*GAMMA1+ALPHA1*DMDE)*QZ28+ALPHA1*QZ21*4./3.)
     &              /REINF
```

```
      A(4,6,K)=A(4,6,K)-ALPHA1*DMHKM1*QZ32/REINF
      B(4,1,K)=B(4,1,K)-(QZ6*(DMDE*DVDF+MU*D2VDEF/3.)-R*CVCE*CMCF*2./3.
     &                -ET(K)*COSTC*(DVDE*(DZIDF*(ET(K)*CMCE-2.*MU)
     &                                  +2.*ZI(K)*DMDF)/3.
     &                              -MU*(2.*R*D2WDE-ET(K)*CZIDF*C2VCE/3.)
     &                              -2.*R*DMDE*DWDE)
     &                -ET(K)*DWDE*(MU*D2ZIDF+DMDF*DZIDF)*4./3.
     &                +ZI(K)*((DWDF*DMDF+MU*D2WDF)*8./3.-2.*MU*LVCF*COSTC)
     &                -ET(K)*DZIDF*(D2WDEF*2.*MU+CWCF*CMDE)*4./3.)/REINF
      B(4,3,K)=B(4,3,K)-(DZIDF*(QZ29*ALPHA2*MU
     &                      -R*ET(K)*(GAMMA2*MU+ALPHA2*DMDE)/3.)
     &                +QZ8*QZ30)/REINF
      B(4,4,K)=B(4,4,K)-((MU*GAMMA2+ALPHA2*DMDE)*CZ28+ALPHA2*CZ21*4./3.)
     &                /REINF
      B(4,6,K)=B(4,6,K)-(ALPHA2*DMH*QZ32
     &               +DMH*(ZI(K)*COSTC*(ET(K)*DZIDF*CVDE-ZI(K)*CVCF)
     &                    +R*(ZI(K)*D2VDEF-DZIDF*(DVDE+ET(K)*C2VCE))/3.
     &                    +D2WDE*QZ28+ZI(K)*ZI(K)*D2WDF*4./3.
     &                    +ET(K)*(DWDE*(2.*DZIDF*DZIDF-ZI(K)*C2ZIDF)
     &                          -2.*ZI(K)*DZIDF*D2WDEF)*4./3.))/REINF
      C(4,3,K)=C(4,3,K)-(DZIDF*(QZ29*ALPHA3*MU
     &                      -R*ET(K)*(GAMMA3*MU+ALPHA3*DMDE)/3.)
     &                +QZ12*QZ30)/REINF
      C(4,4,K)=C(4,4,K)-((MU*GAMMA3+ALPHA3*DMDE)*CZ28+ALPHA3*QZ21*4./3.)
     &                /REINF
      C(4,6,K)=C(4,6,K)-ALPHA3*DMHKP1*QZ32/REINF
      F(4,K)=F(4,K)+( R   *(DMDE*(ZI(K)*DVDF-ET(K)*DZIDF*DVCE/3.)
     &                    +MU*(ZI(K)*D2VDEF-DZIDF*(DVCE+ET(K)*C2VCE))/3.
     &                    -ZI(K)*DMDF*DVDE*2./3.)
     &              +QZ28*(DMDE*DWDE+MU*D2WDE)
     &              +ZI(K)*ZI(K)*DWDF*DMDF*4./3.
     &              +ET(K)*DZIDF*DZIDF*MU*DWDE*8./3.
     &              +ZI(K)*(MU*(COSTC*(ET(K)*DZIDF*CVCE-ZI(K)*CVCF)
     &                        +(4.*(ZI(K)*D2WDF-ET(K)*D2ZIDF*CWCE)
     &                         -R*DDVLM1/DF)/3.)
     &                    -ET(K)*DZIDF*(DWDF*DMDE+DMDF*DWCE
     &                                  +2.*MU*(D2WDEF-DDWLM1/DF))*4./3.))
     &              /REINF
C          THE CONTINUITY EQUATION
      A(5,1,K)=ALPHA1*COSTC*RHOKM1*ET(KM1)*(V(KM1)-U(KM1)*ET(K)*DZIDX)
      A(5,2,K)=-ALPHA1*ET(K)*DZIDX*RHOKM1*RKM1
      A(5,3,K)=ALPHA1*RHOKM1*RKM1
      A(5,4,K)=-ALPHA1*ET(K)*DZIDF*RHOKM1
      A(5,5,K)=DRPKM1*QZ33
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```
      A(5,6,K)=DRHKM1*QZ33
      B(5,1,K)=ET(K)*(RHO*COSTC*(U(K)*(ZI(K)/DX-ALPHA2*ET(K)*CZIDX)
     &                    +ALPHA2*V(K))-DRURE/DX)     +DRWF+DRURX
      B(5,2,K)=RHO*R*(ZI(K)/DX-ALPHA2*ET(K)*DZIDX)
      B(5,3,K)=RHO*R*ALPHA2
      B(5,4,K)=-RHO*ALPHA2*ET(K)*DZIDF
      B(5,5,K)=DRP*QZ34
      B(5,6,K)=DRH*QZ34
      C(5,1,K)=ALPHA3*RHOKP1*ET(KP1)*COSTC*(V(KP1)-U(KP1)*ET(K)*CZIDX)
      C(5,2,K)=-ALPHA3*RHOKP1*RKP1*ET(K)*DZIDX
      C(5,3,K)=ALPHA3*RHOKP1*RKP1
      C(5,4,K)=-ALPHA3*RHOKP1*ET(K)*DZIDF
      C(5,5,K)=DRPKP1*QZ35
      C(5,6,K)=DRHKP1*QZ35
      F(5,K)=-DRVRE-ZI(K)*DRWF+ET(K)*DZIDF*DRWE
     &       -ZI(K)*DRURX + ET(K)*DZIDX*DRURE
C          THE ENERGY EQUATION
      A(6,1,K)=QZ1*H(KM1)
      A(6,2,K)=QZ2*H(KM1)
      A(6,3,K)=QZ3*H(KM1)
      A(6,4,K)=QZ4*H(KM1)
      A(6,5,K)=QZ5*H(KM1)*DRPKM1+QZ0*ME*(ET(K)*(DZIDF*W(K)+CZIDX*R*U(K))
     &                                   -R*V(K))
      A(6,6,K)=QZ5*(H(KM1)*DRHKM1+RHOKM1)
      B(6,1,K)=QZ6*(DRVHRE+ET(K)*(DZIDF*(ME*DPDE*W(K)-DRWHE)
     &                    -DZIDX*DRUHRE)-ME*DPDX*2.*R*ZI(K)*U(K))
     &       +QZ7*ZI(K)*(DRUHRX+DRWHF-W(K)*ME*DPDF)
     &       +(2.*ZI(K)*ET(K)*COSTC+R)*ME*DPDE*R*(ET(K)*U(K)*CZIDX-V(K))
     &       +R*ZI(K)*ET(K)*((U(K)*(R*ME*DPDE+ZI(K)*RHO*H(K)*COSTC)
     &                    -DRUHRE)/DX
     &                    +ALPHA2*RHO*H(K)*COSTC*(V(K)-U(K)*ET(K)
     &                                                  *CZIDX))
      B(6,2,K)=R*ZI(K)*(RHO*R*H(K)*(ZI(K)/DX-ET(K)*CZIDX*ALPHA2)
     &                +ME*R*(ET(K)*DZIDX*DPDE-ZI(K)*DPDX))
      B(6,3,K)=0*R*ZI(K)*(ALPHA2*RHO*H(K)-ME*DPDE)
      B(6,4,K)= *ZI(K)*(ET(K)*DZIDF*(ME*DPDE-ALPHA2*RHO*H(K))
     &                -ME*ZI(K)*DPDF)
      B(6,5,K)=(H(K)*DRP-ME)*QZ36
C          IF DP/DX IS EVALUATED EXPLICITLY OR SET TO ZERO REDEFINE B65K
      IF (SUBP1)
     &B(6,5,K) = H(K)*DRP*QZ36
     & -ME*R*ZI(K)*(R*U(K)*(    0.    -ALPHA2*ET(K)*DZIDX)
     &                +ALPHA2*(V(K)*R-ET(K)*DZIDF*W(K)))
      B(6,6,K)=(H(K)*DRH+RHO)*QZ36
```

| | | | | | | |
|---|---|---|---|---|---|---|
| .58485E-03 | .40593E+00 | .10658E-01 | .45083E-01 | .27932E-01 | .61309E+01 | .82675E+01 |
| .66430E-03 | .45601E+00 | .12858E-01 | .45559E-01 | .27905E-01 | .68813E+01 | .86917E+01 |
| .75213E-03 | .51048E+00 | .15341E-01 | .45114E-01 | .27893E-01 | .58104E+01 | .91749E+01 |
| .84874E-03 | .56936E+00 | .18165E-01 | .43282E-01 | .27846E-01 | .55446E+01 | .97224E+01 |
| .95416E-03 | .63230E+00 | .21308E-01 | .40304E-01 | .27806E-01 | .51917E+01 | .10336E+02 |
| .10699E-02 | .69962E+00 | .24919E-01 | .39998E-01 | .27738E-01 | .47321E+01 | .11022E+02 |
| .11973E-02 | .77071E+00 | .29051E-01 | .30444E-01 | .27646E-01 | .41488E+01 | .11775E+02 |
| .13374E-02 | .84349E+00 | .33935E-01 | .23966E-01 | .27519E-01 | .34348E+01 | .12563E+02 |
| .14915E-02 | .91232E+00 | .39516E-01 | .17395E-01 | .27344E-01 | .26181E+01 | .13296E+02 |
| .16515E-02 | .96237E+00 | .44898E-01 | .12726E-01 | .27083E-01 | .18608E+01 | .13763E+02 |
| .18116E-02 | .98376E+00 | .47754E-01 | .11763E-01 | .26691E-01 | .14496E+01 | .13868E+02 |
| .19717E-02 | .98974E+00 | .48390E-01 | .14640E-01 | .26280E-01 | .13340E+01 | .13894E+02 |
| .21318E-02 | .98469E+00 | .48195E-01 | .19806E-01 | .25829E-01 | .13411E+01 | .13785E+02 |
| .22916E-02 | .98547E+00 | .48216E-01 | .25462E-01 | .25426E-01 | .13302E+01 | .13799E+02 |
| .24512E-02 | .98969E+00 | .48891E-01 | .31604E-01 | .25009E-01 | .13193E+01 | .13795E+02 |
| .26109E-02 | .98504E+00 | .49610E-01 | .38018E-01 | .24601E-01 | .13049E+01 | .13795E+02 |
| .27705E-02 | .98603E+00 | .50778E-01 | .44399E-01 | .24211E-01 | .12938E+01 | .13796E+02 |
| .29303E-02 | .98605E+00 | .52081E-01 | .50879E-01 | .23819E-01 | .12828E+01 | .13795E+02 |
| .30900E-02 | .98605E+00 | .53720E-01 | .57327E-01 | .23461E-01 | .12714E+01 | .13796E+02 |
| .32456E-02 | .98595E+00 | .55469E-01 | .63573E-01 | .23095E-01 | .12615E+01 | .13796E+02 |
| .33894E-02 | .98581E+00 | .57249E-01 | .69312E-01 | .22807E-01 | .12531E+01 | .13796E+02 |
| .35092E-02 | .98565E+00 | .58892E-01 | .74336E-01 | .22532E-01 | .12457E+01 | .13796E+02 |
| .36209E-02 | .98547E+00 | .60461E-01 | .78822E-01 | .22315E-01 | .12392E+01 | .13796E+02 |
| .37207E-02 | .98530E+00 | .61855E-01 | .82834E-01 | .22102E-01 | .12334E+01 | .13797E+02 |
| .38125E-02 | .98512E+00 | .63147E-01 | .86465E-01 | .21936E-01 | .12281E+01 | .13797E+02 |
| .38964E-02 | .98497E+00 | .64231E-01 | .89739E-01 | .21767E-01 | .12230E+01 | .13797E+02 |
| .39722E-02 | .98483E+00 | .65191E-01 | .92583E-01 | .21651E-01 | .12186E+01 | .13797E+02 |
| .40401E-02 | .98474E+00 | .65837E-01 | .94987E-01 | .21521E-01 | .12144E+01 | .13798E+02 |
| .41016E-02 | .98464E+00 | .66485E-01 | .96917E-01 | .21476E-01 | .12113E+01 | .13798E+02 |
| .41575E-02 | .98465E+00 | .66485E-01 | .98391E-01 | .21329E-01 | .12077E+01 | .13798E+02 |
| .42094E-02 | .98447E+00 | .67536E-01 | .99243E-01 | .21532E-01 | .12080E+01 | .13798E+02 |
| .42573E-02 | .98530E+00 | .62932E-01 | .99882E-01 | .20368E-01 | .11958E+01 | .13800E+02 |

AT FI = 180.00 CFINF = .71096E-02 STINF = .24642E-01 SHOCK DISTANCE = .43790E-02

| Y | U | V | W | P | H | H TOTAL |
|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | .26371E-01 | .55093E+01 | .55093E+01 |
| .16429E-04 | .12572E-01 | .14091E-04 | .17400E-02 | .26380E-01 | .55747E+01 | .55788E+01 |
| .34493E-04 | .26241E-01 | .63504E-04 | .35756E-02 | .26392E-01 | .56422E+01 | .56512E+01 |

```
     &        +MU*QZ42*ME/REINF
C          NOW THE VISCOUS DISSIPATION TERMS
      A(6,2,K)=A(6,2,K)-QZ37*ALPHA1*ME/REINF
      A(6,4,K)=A(6,4,K)-QZ38*ALPHA1*ME/REINF
      B(6,1,K)=B(6,1,K)-2.*MU*(R*ET(K)*COSTC*QZ39+ZI(K)*QZ40-QZ41)
     &                  *ME/REINF
      B(6,2,K)=B(6,2,K)-QZ37*ALPHA2*ME/REINF
      B(6,4,K)=B(6,4,K)-QZ38*ALPHA2*ME/REINF
      B(6,6,K)=B(6,6,K)-DMH*QZ42*ME/REINF
      C(6,2,K)=C(6,2,K)-QZ37*ALPHA3*ME/REINF
      C(6,4,K)=C(6,4,K)-QZ38*ALPHA3*ME/REINF
C          ADD IN THE CONTRIBUTIONS FROM THE PHI-DERIVATIVE TERMS.
      QX1 = ET(K)*((DZIDF*(2.*ET(K)*DMDE+4.*MU) -ZI(K)*DMDF)*BETA2
     &            -EPS2*ZI(K)*MU)*RREINF
      QX2 = R*ZI(K)*ZI(K)*BETA2
      QX3 = ZI(K)*(BETA2*(ZI(K)*DMDF-ET(K)*DZIDF*(DMDE+2.*MU*ALPHA2))
     &            +EPS2*ZI(K)*MU)*RREINF
      QX4 = QX2*W(K)
      QX5 = QX4*RHO
      QX6 = QX4*U(K)
      QX7 = QX4*V(K)
      QX8 = QX4*W(K)
      QX9 = QX4*H(K)
      QX10 = 2.*ET(K)*MU*ZI(K)*DZIDF*RREINF*BETA2
      QX11 = QX10*ALPHA1
      QX12 = QX10*ALPHA3
      QX13 = R*MU*ZI(K)*RREINF*BETA2
      QX14 = QX13*ALPHA1
      QX15 = QX13*ALPHA3
      QX16 = 2.*ET(K)*CON*ZI(K)*DZIDF*RPRRE*BETA2
      A(2,2,K) = A(2,2,K) + QX11
      B(2,1,K) = B(2,1,K) - R*ZI(K)*ET(K)*DRWUE*BETA2 -QX1*CUCE
     &                    +RREINF*BETA2*ET(NK)*(ZI(K)*DMCE*CUCF
     &                       +2.*MU*(ZI(K)*D2UDEF-ET(K)*CZICF*C2UCE))
      B(2,2,K) = B(2,2,K) + QX5 - QX3
      B(2,4,K) = B(2,4,K) + QX2*RHO*U(K)
      B(2,5,K) = B(2,5,K) + DRP*QX6
      B(2,6,K) = B(2,6,K) + DRH*QX6
     &            -RREINF*DMH*ZI(K)*BETA2*(ZI(K)*DUDF-ET(K)*CZIDF*DUCE)
      C(2,2,K) = C(2,2,K) + QX12
      A(3,3,K) = A(3,3,K) + QX11
      A(3,4,K) = A(3,4,K) - QX14/3.
      B(3,1,K) = B(3,1,K) - R*ZI(K)*ET(K)*DRWVE*BETA2 -QX1*CVCE
     &                    +RREINF*BETA2*(ET(NK)*(ZI(K)*DMCE*CVCF
```

```
&                          +2.*MU*(ZI(K)*D2VDEF-ET(K)*DZIDF*D2VDE))
&              +(DWDE*(ET(K)*(R*DMDE+2.*MU*COSTC*ZI(K))+R*MU)
&                +D2WDE*R*MU*ET(K))/3.)
 B(3,3,K) = B(3,3,K) + QX5 - QX3
 B(3,4,K) = B(3,4,K) + QX2*RHO*V(K) -RREINF*BETA2*ZI(K)*
&                     (R*MU*ALPHA2-2.*R*DMDE+2.*MU*ZI(K)*COSTC)/3.
 B(3,5,K) = B(3,5,K) + DRP*QX7
 B(3,6,K) = B(3,6,K) + DRH*QX7 -RREINF*BETA2*ZI(K)*DMH*
&                     (ZI(K)* DVDF+R*DWDE -ET(K)*DZIDF*DVDE)
 C(3,3,K) = C(3,3,K) + QX12
 C(3,4,K) = C(3,4,K) - QX15/3.
 A(4,3,K) = A(4,3,K) - QX14/3.
 A(4,4,K) = A(4,4,K) + QX11*4./3.
 B(4,1,K) = B(4,1,K) - R*ZI(K)*ET(K)*BETA2*(DRWHE+DPDE)
&            -QX1*DWDE*4./3. + RREINF*BETA2*(DVDE*(ET(K)*(R*DMDE/3.
&                -MU*COSTC*ZI(K))+R*MU/3.) +D2VDE*R*MU*ET(K)/3.
&           +ET(K)*(ZI(K)*(DMDE*DWDF+2.*MU*D2WDEF)
&                  -2.*MU*ET(K)*DZIDF*D2WDE)*4./3.)
 B(4,3,K) = B(4,3,K) - RREINF*BETA2*ZI(K)*(R*MU*ALPHA2/3.+R*DMDE
&                                          -MU*ZI(K)*COSTC)
 B(4,4,K) = B(4,4,K) +2.*QX5      -QX3*4./3.
 B(4,5,K) = B(4,5,K) +DRP*QX8 +QX2
 B(4,6,K) = B(4,6,K) +DRH*QX8 -RREINF*BETA2*ZI(K)*DMH*
&             (4.*ZI(K)*DWDF -2.*R*DVDE -4.*ET(K)*DZIDF*DWDE)/3.
 C(4,3,K) = C(4,3,K) - QX15/3.
 C(4,4,K) = C(4,4,K) + QX12*4./3.
 B(5,1,K) = B(5,1,K) - ET(K)*DRWE*BETA2
 B(5,4,K) = B(5,4,K) + ZI(K)*RHO*BETA2
 B(5,5,K) = B(5,5,K) + DRP*ZI(K)*W(K)*BETA2
 B(5,6,K) = B(5,6,K) + DRH*ZI(K)*W(K)*BETA2
 A(6,6,K) = A(6,6,K) + QX16*ALPHA1
 B(6,1,K) = B(6,1,K) - R*ZI(K)*ET(K)*BETA2*(DRWHE-ME*W(K)*DPDE)
&        -RPRRE*ET(K)*(((DZIDF*(2.*ET(K)*DCDE+4.*CCN)
&                                          -ZI(K)*DCDF)*BETA2
&                      -EPS2*ZI(K)*CON)*DHDE
&              -BETA2*(ZI(K)*DCDE*DHDF+
&                2.*CON*(ZI(K)*D2HDEF-ET(K)*DZIDF*D2HDE)))
&     -RREME*MU*ET(K)*BETA2*2.*(DUDE*(ET(K)*DZIDF*DUDE-ZI(K)*DUDF)
&                          +DWDE*(ET(K)*DZIDF*DWDE-ZI(K)*DWDF)*4./3.)
 B(6,2,K) = B(6,2,K) -RREME*2.*MU*ZI(K)*BETA2*(ZI(K)*DUDF
&                                          -ET(K)*DZIDF*DUDE)
 B(6,4,K) = B(6,4,K) +QX2*RHO*H(K)-RREME*8./3.*MU*ZI(K)*BETA2
&                                   *(ZI(K)*DWDF-ET(K)*DZIDF*DWDE)
 B(6,5,K) = B(6,5,K) +DRP*QX9 -ME*QX4
```

```
      B(6,6,K) = B(6,6,K) +DRH*QX9 +QX5 -RPRRL*ZI(K)*
     &   (BETA2*(ZI(K)*(DCDF+DCH*DHDF)-ET(K)*DZIDF*(DCDE
     &                                    +2.*CON*ALPHA2+DCH*DHDE))
     &            +EPS2*ZI(K)*CON)
      C(6,6,K) = C(6,6,K) + QX16*ALPHA3
C          ADD IN SOME TERMS TO THE ENERGY EQUATION THAT HAD BEEN
C          FORGOTTEN.
      QZ43 = 2.*MU*(QZ24*DVDE -ET(K)*DZIDF*(ZI(K)*DVDF+R*DWDE/3.))
     &              -2./3. *R*ZI(K)*DWDF
      QZ44 = 2.*MU*R*(ZI(K)*DVDF -ET(K)*DZIDF*DVDE/3.)
      QZ45 = -ET(K)*DZIDF*DVDF*DVDE -R*(DVDE*DWDF*2./3.-DWDE*DVDF)
      QZ46 = QZ24*DVDE*DVDE+ZI(K)*ZI(K)*DVDF*DVDF
     &    -2.*ET(K)*DZIDF*DVDE*(ZI(K)*DVDF+R*DWDE/3.)
     &   +2.*R*ZI(K)*(DWDE*DVDF-DVDE*DWDF*2./3.)
      A(6,3,K) = A(6,3,K) -QZ43*ALPHA1*RREME
      A(6,4,K) = A(6,4,K) -QZ44*ALPHA1*RREME
      B(6,1,K) = B(6,1,K) -2.*MU*(R*ET(K)*COSTC*DVDE*DVDE*4./3.
     &                          +ZI(K)*DVDF*DVDF +QZ45
     &      -ET(K)*COSTC*(ZI(K)*(DVDE*DWDF*2./3.-DWDE*DVDF)
     &                  -ET(K)*DZIDF*DVDE*DWDE/3.) )*RREME
     &      -RREME*2.*MU*ET(K)*DVDE*BETA2*(ET(K)*DZIDF*DVDE
     &                        -ZI(K)*DVDF-R*DWDE/3.)
      B(6,3,K) = B(6,3,K) -QZ43*ALPHA2*RREME
     &      -RREME*2.*MU*ZI(K)*BETA2*(ZI(K)*DVDF-ET(K)*DZIDF*DVDE
     &                                          +R*DWDE)
      B(6,4,K) = B(6,4,K) -QZ44*ALPHA2*RREME
     &      +RREME*MU*R*ZI(K)*DVDE*BETA2*4./3.
      B(6,6,K) = B(6,6,K) -DMH*QZ46*RREME
      C(6,3,K) = C(6,3,K) -QZ43*ALPHA3*RREME
      C(6,4,K) = C(6,4,K) -QZ44*ALPHA3*RREME
      F(6,K) = F(6,K) +MU*QZ46*RREME
      IF (.NOT.SUBSON)  RETURN
C          IF DP/DETA IS SET TO ZERO, REDEFINE A FEW COEFFICIENTS.
      DO 500 I=1,6
      A(3,I,K) = A(5,I,K)
      B(3,I,K) = B(5,I,K)
      C(3,I,K) = C(5,I,K)
      A(5,I,K) = 0.0
      B(5,I,K) = 0.0
      C(5,I,K) = 0.0
  500 CONTINUE
      A(5,5,K) = 0.
      B(5,5,K) = 1.
      C(5,5,K) = -1.
```

```
      F(3,K) = F(5,K)
      F(5,K) = P(K+1) - P(K)
      RETURN
      END
      SUBROUTINE BCIC (NJ,NK,NL,U,V,W,H,P,ZI,UJM1,VJM1,WJM1,HJM1,PJM1,
     &                 ZIJM1,          ET,FI,X,VB,HB)
C           THIS SUBROUTINE READS IN THE MESH DISTRIBUTION FOR X, ET,
C           AND FI.  THE BOUNDARY CONDITIONS AND THE INITIAL CONDITIONS
C           ARE ALSO READ IN.
C           TAPE3 IS THE INPUT TAPE WHEN THE INITIAL CONDITIONS ARE READ
C           FROM TAPE
      REAL   MU
      LEVEL 2,U,UJM1,V,VJM1,W,WJM1,H,HJM1,P,PJM1,ZI,ZIJM1
      DIMENSION U(NK,NL),UJM1(NK,NL),V(NK,NL),VJM1(NK,NL),
     &          W(NK,NL),WJM1(NK,NL),H(NK,NL),HJM1(NK,NL),
     &          P(NK,NL),PJM1(NK,NL),ZI(NK,NL),ZIJM1(NK,NL),
     &          ET(NK),FI(NL),X(NJ),VB(NJ,NL),HB(NJ,NL)
      COMMON QZ(8),IQZ(3)
C**********IF THE PLANE OF INITIAL CONDITIONS IS TO BE READ FROM TAPE***
C**********THEN THE DIMENSIONS OF UVWPHZ MUST BE WHATEVER THEY WERE*****
C**********WHEN THE SOLUTION WAS ORIGINALLY WRITTEN ON THE TAPE.********
      COMMON /OUTDEP/ UVWPHZ(50,20,6)
      JJ=0
      LL=0
      READ (5,1020)  IREAD
      IF (IREAD.GT.0)  GO TO 105
      DO 100 L=1,NL
C           READ IN A VALUE FOR FI AND THE CORRESPONDING VALUE
C           FOR ZI.  (ZI IS NOT A FUNCTION OF ETA.)
      READ (5,1010) FI(L),ZI(1,L)
      FI(L)=FI(L)*.0174532925199433
C           READ IN THE INITIAL VALUES OF THE SOLUTION (THE VALUES AT
C           X=X(I)) ALONG A RAY NORMAL TO THE BODY.
      READ (5,1010) (ET(K),U(K,L),V(K,L),W(K,L),P(K,L),H(K,L),K=1,NK)
      WRITE(6,1010) (ET(K),U(K,L),V(K,L),W(K,L),P(K,L),H(K,L),K=1,NK)
      QZ1=1./ZI(1,L)
      DO 50 K=1,NK
      ET(K)=ET(K)*QZ1
   50 CONTINUE
  100 CONTINUE
  105 CONTINUE
C           READ IN THE DISTRIBUTION OF X-STATIONS ALONG THE BODY
C           AT WHICH THE SOLUTION WILL BE OBTAINED.
      NJDR6=NJ
```

```
      IF (NJ.GT.6)  NJOR6=6
      READ (5,1010) (X(J),J=1,NJOR6)
      IF (NJ.LE.2)  GO TO 180
      IF (X(2).LT.X(3).AND.NJ.GT.6)  READ (5,1010) (X(J),J=7,NJ)
C          IF ALL OF THE X-STATIONS ARE TO BE READ IN, READ IN THE REST
C          OF THEM
      IF (X(2).LT.X(3))  GO TO 180
      DX=X(2)-X(1)
C          THE REST OF THE X-STATIONS CAN BE GENERATED FROM THE FIRST
C          ONE.  EACH SUCCESSIVE X-STATION IS MADE PROPORTIONAL TO THE
C          PREVIOUS ONE.
      DO 175 J=2,NJ
C**********THE PROPORTIONALITY CONSTANT (THE NUMBER CLOSE TO 1.) ON THE*
C***********NEXT CARD MUST BE CHANGED HERE TO WHATEVER IS NEEDED.********
      IXJ = 1.03 *X(J-1)*1000. + .5
      X(J) = IXJ
      X(J) = X(J) * .001
  175 CONTINUE
  180 CONTINUE
      WRITE (6,1010) X
      IF (IREAD.LE.0)  GO TO 145
C          READ IN THE INITIAL PLANE FROM TAPE3.
      EPS = 1.E-10
      READ (3) QZ,IQZ
      READ (3) XX,ET,FI,UVWPHZ
      IF (X(1)-EPS.LE.XX)  GO TO 140
  130 CONTINUE
      READ (3) XX,ET,FI,UVWPHZ
      IF (X(1)-EPS.GT.XX)  GO TO 130
  140 CONTINUE
      DO 122 L=1,NL
      DO 122 K=1,NK
      U(K,L) = UVWPHZ(K,L,1)
      V(K,L) = UVWPHZ(K,L,2)
      W(K,L) = UVWPHZ(K,L,3)
      P(K,L) = UVWPHZ(K,L,4)
      H(K,L) = UVWPHZ(K,L,5)
      ZII(K,L) = UVWPHZ(K,L,6)
  122 CONTINUE
      BACKSPACE 3
      BACKSPACE 3
      READ (3) XX,ET,FI,UVWPHZ
      DO 128 L=1,NL
      DO 128 K=1,NK
```

```
      UJM1(K,L) = UVWPHZ(K,L,1)
      VJM1(K,L) = UVWPHZ(K,L,2)
      WJM1(K,L) = UVWPHZ(K,L,3)
      PJM1(K,L) = UVWPHZ(K,L,4)
      HJM1(K,L) = UVWPHZ(K,L,5)
      ZIJM1(K,L) = UVWPHZ(K,L,6)
  128 CONTINUE
  145 CONTINUE
C           READ IN THE VALUES OF V AND H ALONG THE BODY AT VARIOUS
C           L-J (ETA-X) GRID POINTS.  LINEAR INTERPOLATION WILL BE USED
C           TO OBTAIN VALUES OF VB AND HB WHERE THEY ARE NOT SPECIFIED.
  200 CONTINUE
      READ (5,1020) L
  250 CONTINUE
      READ (5,1020) J,VB(J,L),HB(J,L)
      VB2=VB(J,L)
      HB2=HB(J,L)
      IF (J-JJ.LE.1) GO TO 400
      JM1=J-1
      JJP1=JJ+1
      QZ1=1./(X(J)-X(JJ))
      QZ2=(HB2-HB1)*QZ1
      QZ1=(VB2-VB1)*QZ1
      DO 300 I1=JJP1,JM1
      QZ3=X(I1)-X(JJ)
      VB(I1,L)=VB1+QZ1*QZ3
      HB(I1,L)=HB1+QZ2*QZ3
  300 CONTINUE
  400 CONTINUE
      VB1=VB2
      HB1=HB2
      JJ=J
      IF (J.LT.NJ) GO TO 250
      IF (L-LL.LE.1) GO TO 700
      LM1=L-1
      LLP1=LL+1
      DO 600 I1=1,NJ
      VB1=VB(I1,LL)
      HB1=HB(I1,LL)
      QZ1=1./(FI(L)-FI(LL))
      QZ2=(HB(I1,L)-HB1)*QZ1
      QZ1=(VB(I1,L)-VB1)*QZ1
      DO 500 I2=LLP1,LM1
      QZ3=FI(I2)-FI(LL)
```

```
      VB(I1,I2)=VB1+QZ1*QZ3
      HB(I1,I2)=HB1+QZ1*QZ3
  500 CONTINUE
  600 CONTINUE
  700 CONTINUE
      LL=L
      IF (L.LT.NL) GO TO 200
 1010 FORMAT (6E12.5)
 1020 FORMAT (I12,5E12.5)
      IF (IRCAD.GT.0)  RETURN
C          DEFINE THE SOLUTION SO THAT THE X-DERIVATIVES FOR THE
C          FIRST X-STEP WILL BE ZERO.
      DO 800 I2=1,NL
      DO 800 I1=1,NK
      UJM1(I1,I2)=U(I1,I2)
      VJM1(I1,I2)=V(I1,I2)
      WJM1(I1,I2)=W(I1,I2)
      HJM1(I1,I2)=H(I1,I2)
      PJM1(I1,I2)=P(I1,I2)
C          ZI IS NOT A FUNCTION OF ETA (I.E. I1).
      ZI(I1,I2)=ZI(1,I2)
      ZIJM1(I1,I2)=ZI(I1,I2)
  800 CONTINUE
      RETURN
      END
      SUBROUTINE LEQ(A,B,NEQS,NSOLNS,IA,IB,DET)
CLEQ  LINEAR EQUATIONS SOLUTIONS  FORTRAN II VERSION
C     SOLVE A SYSTEM OF LINEAR EQUATIONS OF THE FORM AX=B BY A MODIFIED
C     GAUSS ELIMINATION SCHEME
C
C     NEQS = NUMBER OF EQUATIONS AND UNKNOWNS
C     NSOLNS = NUMBER OF VECTOR SOLUTIONS DESIRED
C     IA = NUMBER OF ROWS OF A AS DEFINED BY DIMENSION STATEMENT ENTRY
C     IB = NUMBER OF ROWS OF B AS DEFINED BY DIMENSION STATEMENT ENTRY
C     ADET = DETERMINANT OF A, AFTER EXIT FROM LEQ
C
      DIMENSION A(IA,IA),B(IB,IB)
      NSIZ = NEQS
      NBSIZ = NSOLNS
C     START SYSTEM REDUCTION
      NUMSYS=NSIZ-1
      DO 14 I=1,NUMSYS
      NN=I+1
      BIG=A(1,I)
```

```
      NBGRW=I
      BG=1.0/BIG
C     ELIMINATE UNKNOWNS FROM FIRST COLUMN OF CURRENT SYSTEM
 10   DO 13 K=NN,NSIZ
C     COMPUTE PIVOTAL MULTIPLIER
      PMULT=-A(K,I)*BG
C     APPLY PMULT TO ALL COLUMNS OF THE CURRENT A-MATRIX ROW
      DO 11 J=NN,NSIZ
 11   A(K,J)=PMULT*A(I,J)+A(K,J)
C     APPLY PMULT TO ALL COLUMNS OF MATRIX B
      DO 12 L=1,NBSIZ
 12   B(K,L)=PMULT*B(I,L)+B(K,L)
 13   CONTINUE
 14   CONTINUE
C     DO BACK SUBSTITUTION
C     WITH B-MATRIX COLUMN = NCOLB
   50 DO 15 NCOLB=1,NBSIZ
C     DO FOR ROW = NROW
      DO 19 I=1,NSIZ
      NROW=NSIZ+1-I
      TEMP=0.0
C     NUMBER OF PREVIOUSLY COMPUTED UNKNOWNS = NXS
      NXS=NSIZ-NROW
C     ARE WE DOING THE BOTTOM ROW
      IF(NXS) 16,17,16
C     NO
 16   DO 18 K=1,NXS
      KK=NSIZ+1-K
 18   TEMP=TEMP+B(KK,NCOLB)*A(NROW,KK)
 17   B(NROW,NCOLB)=(B(NROW,NCOLB)-TEMP)/A(NROW,NROW)
C     HAVE WE FINISHED ALL ROWS FOR B-MATRIX COLUMN = NCOLB
 19   CONTINUE
C     YES
C     HAVE WE JUST FINISHED WITH B-MATRIX COLUMN NCOLB=NSIZ
 15   CONTINUE
C     YES
C     WE ARE ALL DONE NOW
C     WHEW...
      RETURN
      END
      SUBROUTINE MODIFY(NK,NL,NEWNK,NEWNL,ET,FI,FINEW,FINEW,
     &                  U,UNEWE,UNEWEF,V,VNEWE,VNEWEF,W,WNEWE,WNEWEF,
     &                  P,PNEWE,PNEWEF,H,HNEWE,HNEWEF,
     &                  ZI,ZINEWE,ZINWEF,
```

```
     &                    UNEW,VNEW,WNEW,PNEW,HNEW,ZINEW,
     &              NJ,VB,HB,VBNEW,HBNEW)
C          THIS SUBROUTINE USES QUADRATIC INTERPOLATION TO OBTAIN THE
C          INITIAL CONDITIONS AT A NEW MESH DISTRIBUTION.
      LEVEL 2,ETNEW,FINEW,U,UNEWE,UNEWEF,V,VNEWE,VNEWEF,
     &         W,WNEWE,WNEWEF,P,PNEWE,PNEWEF,H,HNEWE,HNEWEF,
     &         ZI,ZINEWE,ZINWEF,UNEW,VNEW,WNEW,PNEW,HNEW,ZINEW,
     &         VBNEW,HBNEW
      DIMENSION  ET(NK),FI(NL),ETNEW(NEWNK),FINEW(NEWNL),
     &             U(NK,NL), UNEWE(NEWNK,NL),UNEWEF(NEWNK,NEWNL),
     &             V(NK,NL), VNEWE(NEWNK,NL),VNEWEF(NEWNK,NEWNL),
     &             W(NK,NL), WNEWE(NEWNK,NL),WNEWEF(NEWNK,NEWNL),
     &             P(NK,NL), PNEWE(NEWNK,NL),PNEWEF(NEWNK,NEWNL),
     &             H(NK,NL), HNEWE(NEWNK,NL),HNEWEF(NEWNK,NEWNL),
     &            ZI(NK,NL),ZINEWE(NEWNK,NL),ZINWEF(NEWNK,NEWNL),
     &            UNEW(NEWNK,NEWNL),VNEW(NEWNK,NEWNL),WNEW(NEWNK,NEWNL),
     &            PNEW(NEWNK,NEWNL),HNEW(NEWNK,NEWNL),
     &            ZINEW(NEWNK,NEWNL)
      DIMENSION VB(NJ,NL),HB(NJ,NL)
      DIMENSION VBNEW(NJ,NEWNL),HBNEW(NJ,NEWNL)
      DATA IN12/0/
      IN12 = IN12 + 1
      DO 100 KK=1,NEWNK
C          INTERPOLATE IN ETA.
      IF (KK.EQ.1 .OR. KK.EQ.NEWNK) GO TO 60
      K=K-1
   50 K = K + 1
      IF (K.GT.NK) GO TO 2000
      IF (ETNEW(KK).GT.ET(K)) GO TO 50
      KM1 = K - 1
      K3 = K-2
      IF (K.EQ.2 .OR. K.EQ.NK)  GO TO 55
      IF (ETNEW(KK)-ET(K3) .GT. ET(K+1)-ETNEW(KK))  K3=K+1
      GO TO 57
   55 CONTINUE
      IF (K.EQ.2)  K3=3
   57 CONTINUE
      R1 = (ETNEW(KK)-ET(K3))*(ETNEW(KK)-ET(KM1))
     &    /((ET(K)   -ET(K3))*( ET(K)   -ET(KM1)))
      R2 = (ETNEW(KK)-ET(K))*(ETNEW(KK)-ET(K3))
     &    /((ET(KM1) -ET(K))*( ET(KM1) -ET(K3)))
      R3 = (ETNEW(KK)-ET(KM1))*(ETNEW(KK)-ET(K))
     &    /((ET(K3)  -ET(KM1))*( ET(K3)  -ET(K)))
      GO TO 65
```

```
   60 CONTINUE
      K = L
      IF (KK.EQ.NEWNK)  K = NK
      KM1 = K
      RATIO = 0.
      K3 = K
      R1 = 1.
      R2 = 0.
      R3 = 0.
   65 CONTINUE
      DO 75 L=1,NL
       UNEWE(KK,L) =  U(K,L)*R1 +  U(KM1,L)*R2 +  U(K3,L)*R3
       VNEWE(KK,L) =  V(K,L)*R1 +  V(KM1,L)*R2 +  V(K3,L)*R3
       WNEWE(KK,L) =  W(K,L)*R1 +  W(KM1,L)*R2 +  W(K3,L)*R3
       PNEWE(KK,L) =  P(K,L)*R1 +  P(KM1,L)*R2 +  P(K3,L)*R3
       HNEWE(KK,L) =  H(K,L)*R1 +  H(KM1,L)*R2 +  H(K3,L)*R3
      ZINEWE(KK,L) = ZI(K,L)*R1 + ZI(KM1,L)*R2 + ZI(K3,L)*R3
   75 CONTINUE
  100 CONTINUE
C           INTERPOLATE IN PHI.
      DO 600 LL=1,NEWNL
      IF (LL.EQ.1 .OR. LL.EQ.NEWNL .OR. NL.EQ.1) GO TO 560
      L=L-1
  550 L = L + 1
      IF (L.GT.NL) GO TO 3000
      IF (FINEW(LL).GT.FI(L)) GO TO 550
      LM1 = L-1
      L3 = L-2
      IF (L.EQ.2 .OR. L.EQ.NL)  GO TO 555
      IF (FINEW(LL)-FI(L3) .GT. FI(L+1)-FINEW(LL))  L3=L+1
      GO TO 557
  555 CONTINUE
      IF (L.EQ.2)  L3=3
  557 CONTINUE
      R1 = (FINEW(LL)-FI(L3))*(FINEW(LL)-FI(LM1))
     &    /((FI(L)   -FI(L3))*( FI(L)    -FI(LM1)))
      R2 = (FINEW(LL)-FI(L))*(FINEW(LL)-FI(L3))
     &    /((FI(LM1) -FI(L))*( FI(LM1) -FI(L3)))
      R3 = (FINEW(LL)-FI(LM1))*(FINEW(LL)-FI(L))
     &    /((FI(L3)  -FI(LM1))*( FI(L3)  -FI(L)))
      GO TO 565
  560 CONTINUE
      L = 1
      IF (LL.EQ.NEWNL)  L = NL
```

```
      LM1=L
      RATIO = 0.
      L3 = L
      R1 = 1.
      R2 = 0.
      R3 = 0.
  565 CONTINUE
      DO 575 K=1,NEWNK
      UNEWEF(K,LL)= UNEWE(K,L)*R1 +  UNEWE(K,LM1)*R2 +  UNEWE(K,L3)*R3
      VNEWEF(K,LL)= VNEWE(K,L)*R1 +  VNEWE(K,LM1)*R2 +  VNEWE(K,L3)*R3
      WNEWEF(K,LL)= WNEWE(K,L)*R1 +  WNEWE(K,LM1)*R2 +  WNEWE(K,L3)*R3
      PNEWEF(K,LL)= PNEWE(K,L)*R1 +  PNEWE(K,LM1)*R2 +  PNEWE(K,L3)*R3
      HNEWEF(K,LL)= HNEWE(K,L)*R1 +  HNEWE(K,LM1)*R2 +  HNEWE(K,L3)*R3
      ZINWEF(K,LL)=ZINEWE(K,L)*R1 + ZINEWE(K,LM1)*R2 + ZINEWE(K,L3)*R3
  575 CONTINUE
      IF (IN12.EQ.1)  GO TO 600
      DO 580 J=1,NJ
      VBNEW(J,LL) = VB(J,L)*R1 + VB(J,LM1)*R2 + VB(J,L3)*R3
      HBNEW(J,LL) = HB(J,L)*R1 + HB(J,LM1)*R2 + HB(J,L3)*R3
  580 CONTINUE
  600 CONTINUE
      IF (IN12.EQ.1)  RETURN
      DO 1200 K=1,NEWNK
      ET(K) = ETNEW(K)
 1200 CONTINUE
      DO 1300 L=1,NEWNL
      FI(L) = FINEW(L)
      DO 1300 J=1,NJ
      VB(J,L) = VBNEW(J,L)
      HB(J,L) = HBNEW(J,L)
 1300 CONTINUE
      RETURN
 2000 CONTINUE
      WRITE (6,6010)
 6010 FORMAT (*  THE NEW Y DISTRIBUTION IS NOT WITHIN THE RANGE OF THE O
     &LD DISTRIBUTION*)
      STOP
 3000 CONTINUE
      WRITE (6,6020)
 6020 FORMAT (*  THE NEW PHI DISTRIBUTION IS NOT WITHIN THE RANGE OF THE
     & OLD DISTRIBUTION*)
      WRITE (6,6030) FI,FINEW
 6030 FORMAT (6E15.5)
      STOP
```

```
      END                                                               18050
      SUBROUTINE OUTPUT (NK,NL,X,ET,FI,U,V,W,H,P,ZI)                    18060
      REAL    MU,ME                                                     18070
      REAL    MINF                                                      18080
C           THIS SUBROUTINE OUTPUTS THE SOLUTION AT THE ETA-PHI         18090
C           GRID OF POINTS FOR A SPECIFIC VALUE OF X.                   18100
C           THE SOLUTION IS PRINTED, WRITTEN ON TAPE4, AND WRITTEN ON   18110
C           TAPE2.  TAPE2 CAN BE SET UP AS THE CARD PUNCH SINCE THE     18120
C           FORMAT THAT IS USED FOR TAPE2 IS COMPATIBLE WITH THE FORMAT 18130
C           THAT SUBROUTINE BCIC USES TO READ THE SOLUTION FROM CARDS.  18140
C           HOWEVER FOR RESTART PURPOSES IT IS ADVISABLE TO USE THE     18150
C           WRITE ON TAPE4 READ FROM TAPE3 COMBINATION.                 18160
      LEVEL 2,U,V,W,P,H,ZI                                              18170
      DIMENSION ET(NK),FI(NL),U(NK,NL),V(NK,NL),W(NK,NL),               18180
     &          H(NK,NL),P(NK,NL),ZI(NK,NL)                             18190
      COMMON /PUNCH/ ITAPE                                              18200
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,  18210
     &         MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP     18220
      COMMON /VARY/XJM1,XJ,XJP1,DX,DXJM1,JM1,J,JP1                      18230
      COMMON Y(1)                                                       18240
C**********THE DIMENSIONS OF UVWPHZ MUST BE NUMK,NUML,6 WHERE NUMK AND** 18250
C**********NUML ARE EQUAL TO OR GREATER THAN NK AND NL BUT EQUAL TO OR** 18260
C**********LESS THAN MAXK AND MAXL (SEE THE MAIN PROGRAM).  WHEN THE**** 18270
C**********CDC7600 LEARNS HOW TO READ AND WRITE LARGE CORE ARRAYS UVWPHZ 18280
C**********CAN BE ELIMINATED AND THE SOLUTION (STORED IN LARGE CORE)**** 18290
C**********CAN BE WRITTEN AND READ DIRECTLY.*************************** 18300
      COMMON /OUTDEP/ UVWPHZ(50,20,6)                                   18310
      DATA KTAPE/-1/                                                    18320
      WRITE (6,1100) X                                                  18330
      DO 200 L=1,NL                                                     18340
      QZ1=FI(L)*57.29577951                                             18350
      IF (QZ1.GT.1. .AND. QZ1.LT.119. .AND. L.NE.NL-1)  GO TO 200       18360
      RZET = 1. / (ZI(1,L)*(ET(2)-ET(1)))                               18370
      CALL PROPMC (H(1,L),P(1,L),RHO,DRP,DRH,MU,DZ1,CON,DZ2)            18380
      CFINF = 2.*RREINF*RZET*MU*(U(2,L)-U(1,L))                         18390
      STINF = RPRRE*CON*RZET*(H(2,L)-H(1,L))                            18400
      WRITE (6,1200) QZ1,CFINF,STINF,ZI(1,L)                            18410
C           CONVERT NORMAL COORDINATE TO DIMENSIONED QUANTITY.          18420
      QZ1=ZI(1,L)                                                       18430
      DO 100 K=1,NK                                                     18440
      Y(K)=ET(K)*QZ1                                                    18450
  100 CONTINUE                                                          18460
      DO 193 K=1,NK                                                     18470
C           STATIONS TO BE PRINTED CAN BE CONTROLLED BY AN APPROPRIATE  18480
```

```
C           STATEMENT HERE.
      IF (K.GT.20 .AND. K.LT.NK .AND. L.NE.NL-1 .AND. J.GT.0) GO TO 193
      HTOT = H(K,L) + .500*ME *(U(K,L)*U(K,L) +V(K,L)*V(K,L) +
     &                                                W(K,L)*W(K,L))
      WRITE (6,1300)  Y(K),U(K,L),V(K,L),W(K,L),P(K,L),H(K,L),HTOT
  193 CONTINUE
  200 CONTINUE
  220 CONTINUE
      DO 230 L=1,NL
      DO 230 K=1,NK
      UVWPHZ(K,L,1) = U(K,L)
      UVWPHZ(K,L,2) = V(K,L)
      UVWPHZ(K,L,3) = W(K,L)
      UVWPHZ(K,L,4) = P(K,L)
      UVWPHZ(K,L,5) = H(K,L)
      UVWPHZ(K,L,6) = ZI(K,L)
  230 CONTINUE
      WRITE (4) X,ET,FI,UVWPHZ
      KTAPE=KTAPE+1
      IF (ITAPE.EQ.0)  GO TO 500
      KI=KTAPE/ITAPE
      IF (KTAPE.NE.KI*ITAPE.OR.KTAPE.EQ.0) GO TO 500
      WRITE (2,1100) X
      DO 300 L=1,NL
      QZ1=FI(L)*57.29577951
      WRITE (2,2100) QZ1,ZI(1,L)
      QZ1=ZI(1,L)
      DO 250 K=1,NK
      QZ2=ET(K)*QZ1
      WRITE (2,2100) QZ2,U(K,L),V(K,L),W(K,L),P(K,L),H(K,L)
  250 CONTINUE
  300 CONTINUE
  500 CONTINUE
      RETURN
 1100 FORMAT (*1*,10X,*SOLUTION AT X = *,E15.5)
 1200 FORMAT (///,*  AT FI = *,F8.2, 5X,*CFINF = *,E13.5, 5X,
     &          *STINF = *,E13.5,5X,*SHOCK DISTANCE = *,E13.5,
     &          //,8X,*Y*,14X,*U*,14X,*V*,14X,*W*,14X,*P*,14X,*H*,12X,
     &          *H TOTAL*,//)
 1300 FORMAT (7E15.5)
 2100 FORMAT (6E12.5)
      END
      SUBROUTINE PROP (H,P,RHO,DRP,DRH,MU,DMH,CCN,DCH)
C           THIS SUBROUTINE OBTAINS THE FLUID PROPERTIES.
```

```
      REAL    MU,ME
      REAL    MINF
      LEVEL 2,H,P
      COMMON /CONST/COSTC,SINTC,REINF,PRINF,ME,RREINF,RPRRE,RREME,GM2,
     &          MINF,ALFA,SINALF,CTCA,STSA,STCA,CTSA,PINF,HBAR,SPROP
      DRP=GM2/H
      RHO=DRP*P
      DRH=-RHO/H
C           PROPMC IS AN ENTRY POINT USED TO OBTAIN MU AND CCN.
      ENTRY PROPMC
      MU=SQRT(H)*(1.+SPROP)/(1.+SPROP/H)
      DMH=MU*(H+3.*SPROP)/(2.*H*(H+SPROP))
      CON=MU
      DCH=DMH
      RETURN
C           PROPRO IS AN ENTRY POINT USED TO OBTAIN RHO
      ENTRY PROPRO
      RHO=GM2*P/H
      RETURN
      END
      SUBROUTINE SOLVEQ (NP,NPM1,NPM16,N,A,B,C,F,DELU,DELV,DELW,
     &                   DELH,DELP,DELZI,DEL,RTSIDE,WORK1,WORK2,
     &                   WORK3,WORK4)
C           THIS SUBROUTINE USES A BLOCK TRIDIAGONAL ALGORITHM TO SOLVE
C           THE SYSTEM OF LINEAR EQUATIONS.  SEE--ANALYSIS OF NUMERICAL
C           METHODS BY ISAACSON AND KELLER (1966) PP.58,59,60.
      LEVEL 2,A,B,C,F,DELU,DELV,DELW,DELP,DELH,DELZI,
     &          WORK1,COEFF
      DIMENSION A(N,N,NP),B(N,N,NP),C(N,N,NP),F(N,NP),
     &          DELU(NP),DELV(NP),DELW(NP),DELH(NP),DELP(NP),DELZI(NP)
      DIMENSION DEL(NPM16),RTSIDE(NPM16)
      DIMENSION WORK1(1),WORK2(1),WORK3(1),WORK4(1)
      COMMON /BIGMAT/ COEFF(1)
      DIMENSION BB(6,6),CC(6,6),FF(6)
      M=N*4-1
      LIM=NP+1-NPM1
C           FACTOR THE MATRIX
      DO 103 I1=1,6
      DO 103 I2=1,6
      CC(I1,I2) = 0.
  103 CONTINUE
      DO 115 IN=2,NP
      DO 108 I1=1,6
      DO 108 I2=1,6
```

```
      PROD = A(I1,1,IN)*CC(1,I2)
      DO 107 I3=2,6
      PROD = PROD + A(I1,I3,IN)*CC(I3,I2)
  107 CONTINUE
      B(I1,I2,IN) = B(I1,I2,IN) - PROD
  108 CONTINUE
      DO 109 I1=1,6
      DO 109 I2=1,6
      BB(I1,I2) = B(I1,I2,IN)
      CC(I1,I2) = C(I1,I2,IN)
  109 CONTINUE
      CALL LEQ (BB,CC,6,6,6,6,DET)
      DO 110 I1=1,6
      DO 110 I2=1,6
      C(I1,I2,IN) = CC(I1,I2)
  110 CONTINUE
  115 CONTINUE
C           FORWARD PASS
      DO 203 I1=1,6
      FF(I1) = 0.
  203 CONTINUE
      DO 215 IN=2,NP
      DO 208 I1=1,6
      PROD = A(I1,1,IN)*FF(1)
      DO 207 I3=2,6
      PROD = PROD + A(I1,I3,IN)*FF(I3)
  207 CONTINUE
      F(I1,IN) = F(I1,IN) - PROD
  208 CONTINUE
      DO 209 I1=1,6
      FF(I1) = F(I1,IN)
      DO 209 I2=1,6
      BB(I1,I2) = B(I1,I2,IN)
  209 CONTINUE
      CALL LEQ (BB,FF,6,1,6,6,DET)
      DO 210 I1=1,6
      F(I1,IN) = FF(I1)
  210 CONTINUE
  215 CONTINUE
C           BACKWARD PASS
      DO 303 I1=1,6
      DEL((NP-2)*6+I1) = F(I1,NP)
  303 CONTINUE
      DO 315 IN=3,NP
```

```
      NI = NP+2-IN
      DO 308 I1=1,6
      PROD = C(I1,1,NI)*DEL((NI-1)*6+1)
      DO 307 I3=2,6
      PROD = PROD + C(I1,I3,NI)*DEL((NI-1)*6+I3)
  307 CONTINUE
      DEL((NI-2)*6+I1) = F(I1,NI) - PROD
  308 CONTINUE
  315 CONTINUE

      DO 400 I1=LIM,NP
      I2=(I1-LIM)*N+N-6
      DELU(I1)=DEL(I2+2)
      DELV(I1)=DEL(I2+3)
      DELW(I1)=DEL(I2+4)
      DELP(I1)=DEL(I2+5)
      DELH(I1)=DEL(I2+6)
  400 CONTINUE
      IF (N.EQ.5)  RETURN
      DO 500 I1=LIM,NP
      I2=(I1-LIM)*6
      DELZI(I1)=DEL(I2+1)
  500 CONTINUE
      RETURN
      END
```