ANALYTICAL APPROXIMATIONS
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Analytical Approximation

Chi-Square Integral: To better than .0003 over $m < x^2 < \infty$ and $2m < \infty$, $m$ being considered a continuous parameter,

$$P_m(x^2) = \frac{1}{2^r \Gamma(m/2)} \int_0^{x^2} (\frac{x}{2})^m e^{-x/2} \, dz$$

$$1 - \frac{A}{[1 + a_1 t + a_2 t^2 + a_3 t^3 + a_4 t^4]^{1/4}}.$$

$$t = \sqrt{x^2 - \infty}$$

$$A = .5 - .1323(\frac{2}{m}) - .0036(\frac{2}{m}) + .0038(\frac{2}{m})^{3/2}$$

$$a_1 = .2784 + .0783(\frac{2}{m}) - .0051(\frac{2}{m})$$

$$a_2 = .2304 + .0247(\frac{2}{m}) - .0018(\frac{2}{m})$$

$$a_3 = .0010 + .0592(\frac{2}{m}) - .0852(\frac{2}{m}) + .0398(\frac{2}{m})^{3/2}$$

$$a_4 = .0781 - .0906(\frac{2}{m}) + .0923(\frac{2}{m}) - .0366(\frac{2}{m})^{3/2}.$$

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