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**ANALYTICAL APPROXIMATIONS**

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Volume 19

Cecil Hastings, Jr.  
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**Analytical Approximation**

**Chi-Square Integral: To better than .0007  
over  $0 \leq x \leq 4$  for  $m = 6$ ,**

$$F_m(x) = \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^x \left(\frac{t}{2}\right)^{\frac{m-1}{2}} e^{-\frac{t}{2}} dt$$

$$\doteq .01857x^3 - .00516x^4 + .0004451x^5.$$

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### Analytical Approximation

Chi-Square Integral: To better than .0006 over  
 $0 \leq x < \infty$  for  $n = 10$ ,

$$F_n(m-2+x) = \frac{1}{2\Gamma\left(\frac{n}{2}\right)} \int_0^{m-2+x} \left(\frac{t}{2}\right)^{\frac{n}{2}-1} e^{-\frac{t}{2}} dt$$

$$\approx 1 - \frac{.6289}{\left[1 + .03952x + .00327x^2 + .0001208x^3\right]^4} .$$

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### Analytical Approximation

Chi-Square Integral: To better than .0006 over  
 $0 \leq x \leq \infty$  for  $m = 9$ ,

$$F_m(m-2+x) = \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^{m-2+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$
$$\doteq 1 - \frac{.6371}{\left[1 + .04157x + .003616x^2 + .0001279x^3\right]^4} .$$

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## Analytical Approximation

Chi-Square Integral: To better than .0007 over

$0 \leq x \leq \infty$  for  $m = 8$ ,

$$F_m(m-2+x) = \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^{m-2+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$

$$\doteq 1 - \frac{.6472}{\left[1 + .04402x + .004047x^2 + .000135x^3\right]^4} .$$

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Analytical Approximation

Chi-Square Integral: To better than .0007 over

$0 \leq x \leq \infty$  for  $m = 7$ ,

$$F_m(m-2+x) = \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^{m-2+x} \left(\frac{t}{2}\right)^{\frac{m}{2}-1} e^{-\frac{t}{2}} dt$$

$$\approx 1 - \frac{.6600}{\left[1 + .04707x + .004591x^2 + .0001414x^3\right]^4}$$

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