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Analytical Approximation

Offset Circle Probability Function: We consider the function

\[ q(R, x) = \int_R^{\infty} e^{-\frac{1}{2}(\rho^2 + x^2)} I_0(\rho x) d\rho \]

in which \( I_0(z) \) is the usual Bessel function. To better than .00014 over \((-\infty, \infty)\),

\[ q(1, x) \approx 1 - \frac{0.3935}{\left[1 + 0.3968x^2 + 0.0047x^4 + 0.00028x^6\right]^4} \]

The parametric form used is convenient for approximating fixed-\( R \) cross-sections of the \( q(R, x) \) surface for small values of \( R \).

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Offset Circle Probability Function: We consider the function

\[ q(R,x) = \int_{-\infty}^{\infty} e^{-\frac{1}{2}(r^2+x^2)} I_0(rx) \rho \, dr \]

in which \( I_0(z) \) is the usual Bessel function. To better than \( 0.0035 \) over \((-\infty, \infty)\),

\[ q(2,x) = 1 - \frac{865}{[1+0.38x^2+0.007x^4]^2} \]

The parametric form used is convenient for approximating fixed-\( R \) cross-sections of the \( q(R,x) \) surface for small values of \( R \).

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Offset Circle Probability Function: We consider the function

$$q(R,x) = \int_{R}^{\infty} e^{-\frac{1}{2}(\rho^2 + x^2)} I_0(\rho x) \rho \, d\rho$$

in which $I_0(z)$ is the usual Bessel function. To better than .001 over $(-\infty, \infty)$,

$$q(2,x) = 1 - \frac{.865}{\left[1 + 0.0401x^2 + 0.00309x^4 + 0.000075x^6\right]^4}$$

The parametric form used is convenient for approximating fixed-$R$ cross-sections of the $q(R,x)$ surface for small values of $R$.

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Offset Circle Probability Function: We consider the function

\[ q(R, x) = \int_{-\infty}^{\infty} e^{-\frac{1}{2}(\rho^2 + x^2)} I_0(\rho x) \, d\rho \]

in which \( I_0(z) \) is the usual Bessel function. To better than .0014 over \((-\infty, \infty)\),

\[ q(1, x) \approx 1 - \frac{.393}{[1 + .093x^2 + .007x^4]^4} \]

The parametric form used is convenient for approximating fixed-\( R \) cross-sections of the \( q(R, x) \) surface for small values of \( R \).

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Offset Circle Probability Function: We consider the function

\[ q(R, x) = \int_{R}^{\infty} e^{-\frac{1}{2} (\rho^2 + x^2)} I_0(\rho x) d\rho \]

in which \( I_0(z) \) is the usual Bessel function.

To better than 0.0009 over \((0, \infty)\),

\[ q(2, 2+y) = 1 - \frac{397}{[1 + .236y + .066y^2 + .066y^3]^4} \]

The parametric form used is convenient for approximating fixed-R semi-cross-sections of the \( q(R, R+y) \) surface for any \( R \geq 0 \) and for \( y \) ranging over \((0, \infty)\).