IGCDF

PURPOSE
Compute the inverse Gaussian cumulative distribution function with shape parameter γ.

DESCRIPTION
The inverse Gaussian probability density function is:

$$f(x) = \left(\sqrt{\frac{\gamma}{2\pi x^3}} \right) e^{\frac{-\gamma(x-\mu)^2}{2\mu^2 x}} \qquad \text{for } x \geq 0 \qquad \textbf{(EQ 8-247)}$$

where γ and μ are the shape and location parameters respectively. DATAPLOT calculates the case where μ is 1, which is also known as the Wald distribution. See topic (3) under the General considerations section at the beginning of this chapter for a discussion of generating pdf values for the general form of the distribution. The cumulative distribution can be expressed in terms of the standard normal cumulative distribution function, Φ, as:

$$F(x) = \Phi\left(\sqrt{\frac{\gamma}{x}}\left(\frac{x}{\mu} - 1\right) \right) - e^{\frac{2\gamma}{\mu}} \Phi\left(\left(-\sqrt{\frac{\gamma}{x}}\right)\left(\frac{x}{\mu} + 1\right) \right) \qquad \text{for } x \geq 0 \qquad \textbf{(EQ 8-248)}$$

SYNTAX
LET <y2> = IGCDF(<y1>,<gamma>)   <SUBSET/EXCEPT/FOR qualification>

where <y1> is a variable, a number, or a parameter;
   <y2> is a variable or a parameter (depending on what <y1> is) where the computed inverse Gaussian cdf value is stored;
   <gamma> is a parameter that defines the shape parameter;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
LET A = IGCDF(3,10)
LET Y = IGCDF(X1,2)

NOTE
The inverse Gaussian distribution is nearly symmetric and moderate tailed for small gamma. It is highly skewed and long tailed for large gamma. It approaches normality as gamma approaches zero.

DEFAULT
None

SYNONYMS
WALCDF

RELATED COMMANDS
IGPDF	=	Compute the inverse Gaussian probability density function.
IGPPF	=	Compute the inverse Gaussian percent point function.
WALCDF	=	Compute the Wald cumulative distribution function.
WALPDF	=	Compute the Wald probability density function.
WALPPF	=	Compute the Wald percent point function.
FLPDF	=	Compute the fatigue-life probability density function.
FLPPF	=	Compute the fatigue-life percent point function.
FLCDF	=	Compute the fatigue-life cumulative distribution function.
RIGPDF	=	Compute the reciprocal inverse Gaussian probability density function.
RIGPPF	=	Compute the reciprocal inverse Gaussian percent point function.
RIGCDF	=	Compute the reciprocal inverse Gaussian cumulative distribution function.

REFERENCE
"Continuous Univariate Distributions - 1,", Johnson and Kotz, Houghton-Mifflin, 1970 (chapter 15).

"Statistical Distributions," 2nd ed, Evans, Hastings, and Peacock, Wiley and Sons, 1993 (chapter 21).

APPLICATIONS

Reliability Analysis

IMPLEMENTATION DATE

90/5 (definition was modified 95/1 to be consistent with Johnson and Kotz)

PROGRAM

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SEGMENT 1 COORDINATES 69 38 74 38; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 69 34 74 34; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 69 30 74 30; SEGMENT 3 PATTERN DOT
SEGMENT 4 COORDINATES 69 26 74 26; SEGMENT 4 PATTERN DA2
LEGEND 1 GAMMA = 1; LEGEND 1 COORDINATES 75 37
LEGEND 2 GAMMA = 2; LEGEND 2 COORDINATES 75 33
LEGEND 3 GAMMA = 5; LEGEND 3 COORDINATES 75 29
LEGEND 4 GAMMA = .5; LEGEND 4 COORDINATES 75 25
YLIMITS 0 1
MAJOR YTIC NUMBER 6
MINOR YTIC NUMBER 1
YTIC DECIMAL 1
XLIMITS 0 3
TITLE PLOT IGCDF FOR VARIOUS VALUES OF GAMMA
LINES SOLID DASH DOT DASH2
PLOT IGCDF(X,1) FOR X = 0.01 0.01 3 AND
PLOT IGCDF(X,2) FOR X = 0.01 0.01 3 AND
PLOT IGCDF(X,5) FOR X = 0.01 0.01 3 AND
PLOT IGCDF(X,0.5) FOR X = 0.1 0.01 3
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