

**IGPDF****PURPOSE**

Compute the inverse Gaussian probability density function with shape parameter  $\gamma$ .

**DESCRIPTION**

The inverse Gaussian probability density function is:

$$f(x) = \left( \sqrt{\frac{\gamma}{2\pi x^3}} \right) e^{-\frac{\gamma(x-\mu)^2}{2\mu^2 x}} \quad \text{for } x \geq 0 \quad (\text{EQ 8-249})$$

where  $\gamma$  and  $\mu$  are the shape and location parameters respectively. DATAPLOT calculates the case where  $\mu$  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 inverse Gaussian distribution has mean  $\mu$  and standard deviation  $\text{SQRT}(\mu^3/\gamma)$ .

**SYNTAX**

LET <y2> = IGPDF(<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 pdf value is stored;

<gamma> is a positive number, parameter, or variable that specifies the shape parameter;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

**EXAMPLES**

LET A = IGPDF(3,10)

LET Y = IGPDF(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**

WALPDF

**RELATED COMMANDS**

IGCDF	=	Compute the inverse Gaussian cumulative distribution function.
IGPPF	=	Compute the inverse Gaussian percent point function.
WALPDF	=	Compute the Wald probability density function.
WALPPF	=	Compute the Wald percent point function.
WALCDF	=	Compute the Wald 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.
FLPDF	=	Compute the fatigue-life probability density function.
FLPPF	=	Compute the fatigue-life percent point function.
FLCDF	=	Compute the fatigue-life 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

```
SEGMENT 1 COORDINATES 69 88 74 88; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 69 84 74 84; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 69 80 74 80; SEGMENT 3 PATTERN DOT
SEGMENT 4 COORDINATES 69 76 74 76; SEGMENT 4 PATTERN DA2
LEGEND 1 GAMMA = 1; LEGEND 1 COORDINATES 75 87
LEGEND 2 GAMMA = 2; LEGEND 2 COORDINATES 75 83
LEGEND 3 GAMMA = 5; LEGEND 3 COORDINATES 75 79
LEGEND 4 GAMMA = .5; LEGEND 4 COORDINATES 75 75
TITLE PLOT IGPDF FOR VARIOUS VALUES OF GAMMA
LINES SOLID DASH DOT DA2
YLIMITS 0 2.5
MAJOR Y TIC MARK NUMBER 6
PLOT IGPDF(X,1) FOR X = 0 0.01 3 AND
PLOT IGPDF(X,2) FOR X = 0 0.01 3 AND
PLOT IGPDF(X,5) FOR X = 0 0.01 3 AND
PLOT IGPDF(X,0.5) FOR X = 0 0.01 3
```

