WEIPDF

PURPOSE
Compute the standard form of the Weibull probability density function with tail length parameter γ.

DESCRIPTION
For the minimum order statistic, the standard form of the Weibull probability density function is:

$$f(x) = \gamma x^{(\gamma-1)} e^{-(x^\gamma)} \qquad \text{for } x \geq 0 \qquad \textbf{(EQ 8-358)}$$

For the maximum order statistic, the standard form of the Weibull probability density function is:

$$f(x) = \gamma ((-x)^{(\gamma-1)}) e^{-((-x)^\gamma)} \qquad \text{for } x \leq 0 \qquad \textbf{(EQ 8-359)}$$

In either case, γ should be positive.

SYNTAX
LET <y2> = WEIPDF(<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 Weibull pdf value is stored;
    <gamma> is a positive number or parameter that specifies the tail length parameter;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
LET A = WEIPDF(3,2)
LET Y = WEIPDF(X1,8)

NOTE 1
The SET MINMAX command specifies whether the minimum or the maximum order statistic form is used. Entering SET MINMAX 2 specifies the maximum order statistic while SET MINMAX 1 specifies the minimum order statistic.

NOTE 2
For the minimum order statistic, the general form of the Weibull probability density function is:

$$f(x) = \frac{\gamma}{\alpha}\left(\frac{x-\mu}{\alpha}\right)^{\gamma-1} e^{-\left(\frac{x-\mu}{\alpha}\right)^\gamma} \qquad \text{for } x \geq \mu \qquad \textbf{(EQ 8-360)}$$

For the maximum order statistic, the general form of the Weibull probability density function is:

$$f(x) = \frac{\gamma}{\alpha}\left(\frac{(-x)-\mu}{\alpha}\right)^{\gamma-1} e^{-\left(\frac{(-x)-\mu}{\alpha}\right)^\gamma} \qquad \text{for } x \leq \mu \qquad \textbf{(EQ 8-361)}$$

where μ is the location parameter and α is the scale parameter. 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.

DEFAULT
None

SYNONYMS
None

RELATED COMMANDS
WEICDF	=	Compute the Weibull cumulative distribution function.
WEIPPF	=	Compute the Weibull percent point function.
EXPCDF	=	Compute the exponential cumulative distribution function.
EXPPDF	=	Compute the exponential probability density function.
EXPPPF	=	Compute the exponential percent point function.
EV1CDF	=	Compute the extreme value type I cumulative distribution function.
EV1PDF	=	Compute the extreme value type I probability density function.

EV1PPF = Compute the extreme value type I percent point function.

REFERENCE

"Continuous Univariate Distributions - 1," Johnson and Kotz, Houghton Mifflin, 1970 (chapter 20).

"Statistical Distributions," 2nd Ed., Evans, Hastings, and Peacock, Wiley and Sons, 1993 (chapter 41).

APPLICATIONS

Reliability Analysis

IMPLEMENTATION DATE

Pre-1987 (the SET MINMAX capability was implemented 93/7, earlier versions supported the minimum order statistic only)

PROGRAM

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TITLE WEIPDF FOR VARIOUS VALUES OF GAMMA
X1LABEL X
Y1LABEL PROBABILITY
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 = 0.5; LEGEND 4 COORDINATES 75 75
LINES SOLID DASH DOT DASH2
SET MINMAX 1
PLOT WEIPDF(X,1) FOR X = 0.01 0.01 3 AND
PLOT WEIPDF(X,2) FOR X = 0.01 0.01 3 AND
PLOT WEIPDF(X,5) FOR X = 0.4 0.01 1.6 AND
PLOT WEIPDF(X,0.5) FOR X = 0.05 0.01 2
```