COSINE TRANSFORM

PURPOSE

Compute the cosine transform of a variable.

DESCRIPTION

The cosine transform converts a time domain function into a frequency domain function. In practice, functions are sampled at equally spaced discrete points. The discrete cosine transform is:

$$F_k = \sum_{j=0}^{N-1} f_j \cos\left(\frac{\pi jk}{N}\right) \qquad \textbf{(EQ 3-31)}$$

where f(j) is the data array for j = 0, 1, ... , N-1.

DATAPLOT calculates the discrete cosine transform. If you wish to calculate these transforms for a function, then evaluate this function at a series of points.

See the REFERENCE section below for references which give a more detailed explanation of cosine transforms.

SYNTAX

LET <r1> = COSINE TRANSFORM <y1> <SUBSET/EXCEPT/FOR qualification>
where <y1> is a response variable for which the cosine transform is to be computed;
<r1> is a variable containing the computed cosine transform;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET RPART = COSINE TRANSFORM Y1

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

FOURIER TRANSFORM	=	Compute the Fourier transform.
INVERSE FOUR TRANSFORM	=	Compute the inverse cosine transform.
FFT	=	Compute the fast Fourier transform.
INVERSE FFT	=	Compute the inverse FFT.
SINE TRANSFORM	=	Compute the sine transformation.
SPECTRAL PLOT	=	Generate a spectral plot.

REFERENCE

"Numerical Recipes: The Art of Scientific Computing (FORTRAN Version)," Press, Flannery, Teukolsky, and Vetterling, Cambridge University Press, 1989 (chapter 12).

"Fourier Analysis of Time Series: An Introduction," Peter Bloomfield, John Wiley and Sons, 1976.

APPLICATIONS

Frequency analysis of time series, signal processing

IMPLEMENTATION DATE

87/5

PROGRAM

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TITLE COSINE TRANSFORM
LEGEND 1 TIME SERIES SMOOTHING
.
LET X = SEQUENCE 0 .1 25.55
LET YS = SIN(X)
LET YN = NORMAL RANDOM NUMBERS FOR I = 1 1 256
LET YN = YN/10
LET Y = YS+YN
.
LET U  = COSINE TRANSFORM Y
LET NU = NUMBER U
LET XU = SEQUENCE 1 1 NU
LET XU = XU+50
.
LET U = 2.5*U
PLOT U VS XU
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