

COSHINT**PURPOSE**

Compute the hyperbolic cosine integral.

DESCRIPTION

The hyperbolic cosine integral is defined as:

$$\text{Chi}(x) = \gamma + \ln(x) + \int_0^x \frac{\cosh(t) - 1}{t} dt \quad (\text{EQ Aux-80})$$

where cosh is the hyperbolic cosine function, and γ is Euler's constant (approximately 0.5772...). This integral is undefined for zero and it is typically defined only for positive x since $\text{Chi}(-x) = \text{Chi}(x) - i\pi$. Note that the imaginary part is constant for all negative values. For negative x , DATAPLOT returns the value for the corresponding positive x . An error message is printed if the input value is zero.

This function can underflow for small x (specifically, if e^{-x}/x underflows) and can overflow for large x (specifically, if e^x overflows).

SYNTAX

LET <y2> = COSHINT(<x>) <SUBSET/EXCEPT/FOR qualification>

where <x> is a non-zero number, variable, or parameter;

<y2> is a variable or a parameter (depending on what <x> is where the computed hyperbolic cosine integral values are stored; and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

```
LET A = COSHINT(0.1)
LET A = COSHINT(-0.1)
LET Y = COSHINT(X)
```

NOTE

DATAPLOT uses the routine SICIEI written by Irene Stegum and Ruth Zucker of NIST (see the REFERENCE section below).

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

COSINT	=	Compute the hyperbolic cosine integral.
SININT	=	Compute the sine integral.
SINHINT	=	Compute the hyperbolic sine integral.
EXPINTN	=	Compute the exponential integral of order N.
LOGINT	=	Compute the logarithmic integral.
DAWSON	=	Compute Dawson's integral.

REFERENCE

"SICIEI: Automatic Computing Methods for Special Functions. Part III. The Sine, Cosine, Exponential Integrals and Related Functions," Stegum and Zucker, Journal of Research of the National Bureau of Standards, 80B(2), 1976.

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegun, National Bureau of Standards, 1964 (chapter 5).

APPLICATIONS

Special Functions

IMPLEMENTATION DATE

94/9

PROGRAM

TITLE AUTOMATIC

PLOT COSHINT(X) FOR X = .01 .01 5

