ARCTANH

PURPOSE

Compute the hyperbolic arctangent for a variable or parameter.

DESCRIPTION

The hyperbolic arctangent is the number whose hyperbolic tangent is equal to the given value. The hyperbolic arctangent is defined as:

$$\text{arctanh}(x) = \frac{\log\left(\frac{1+x}{1-x}\right)}{2} \qquad \text{for } -1 < x < 1 \qquad \textbf{(EQ 7-106)}$$

Input values greater than or equal to 1 or less than or equal to -1 generate an error message.

SYNTAX

LET <y2> = ARCTANH(<y1>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a number, parameter, or variable;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed hyperbolic arctangent value is stored;

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

EXAMPLES

LET A = ARCTANH(-2)
LET A = ARCTANH(A1)
LET X2 = ARCTANH(X1-4)

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

ARCCOS	=	Compute arccosine.
ARCCOSH	=	Compute hyperbolic arccosine.
ARCCOT	=	Compute arccotangent.
ARCCOTH	=	Compute hyperbolic arccotangent.
ARCCSC	=	Compute arccosecant.
ARCCSCH	=	Compute hyperbolic arccosecant.
ARCSEC	=	Compute secant.
ARCSECH	=	Compute hyperbolic arcsecant.
ARCSIN	=	Compute arcsine.
ARCSINH	=	Compute hyperbolic arcsine.
ARCTAN	=	Compute arctangent.

APPLICATIONS

Trigonometry

IMPLEMENTATION DATE

Pre-1987

PROGRAM

```
X1LABEL HYPERBOLIC TANGENT VALUE
Y1LABEL INVERSE VALUES
TITLE AUTOMATIC
PLOT ARCTANH(X) FOR X = -.99 0.01 0.99
```