

VECTOR LENGTH

PURPOSE

Compute the length (or norm) of a vector with real elements.

DESCRIPTION

The formula for vector length for vector v with components v_i is:

$$\|v\| = \sqrt{\sum_{i=1}^N v_i^2} \tag{EQ 3-64}$$

SYNTAX

LET <p> = VECTOR LENGTH <v> <SUBSET/EXCEPT/FOR qualification>
 where <v> is the variable containing the (real) elements of the vector;
 <p> is the parameter where the computed length is saved;
 and where the <SUBSET/EXCEPT/FOR qualification> is optional and rarely used in this context.

EXAMPLES

LET L = VECTOR LENGTH Y

NOTE

The vector (x1, x2, ... ,xn) represents the line segment from the origin (0,0,...,0) to the point (x1, x2, ..., xn). That is, each element of the vector represents the corresponding value on the corresponding axis. Vectors are sometimes represented in terms of the unit coordinate vectors. For example, for the 3d case the vector $x=(x_1,x_2,x_3)$ can be written as $a=x_1i + x_2j + x_3k$ where

$$i = (1,0,0) \quad j = (0,1,0) \quad k = (0,0,1)$$

NOTE

Storagewise, a DATAPLOT “variable” and a mathematical “vector” are identical. The ordering of elements within a DATAPLOT variable is identical to the ordering of elements within a mathematical vector. Thus to store the vector with elements 4 11 37 8 19 in the variable Y, enter the following command (the READ and SERIAL READ commands can be used to store longer vectors):

LET Y = DATA 4 11 37 8 19

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

- VECTOR ADDITION = Carries out a vector addition.
- VECTOR SUBTRACTION = Carries out a vector subtraction.
- VECTOR DOT PRODUCT = Computes a vector dot product.
- VECTOR DISTANCE = Computes the vector distance.
- VECTOR ANGLE = Computes the vector angle.
- MATRIX DETERMINANT = Computes the matrix determinant.
- MATRIX EUCLIDEAN NORM = Computes the matrix euclidean norm.

APPLICATIONS

Mathematics

IMPLEMENTATION DATE

87/10

PROGRAM

```
LET Y = DATA 4 2 3 1 6
LET L = VECTOR LENGTH Y
WRITE Y L
. FIND THE DIRECTION COSINES AND DIRECTION ANGLES
LET N = SIZE Y
LOOP FOR K = 1 1 N
    LET TEMP = Y(K)
    LET TEMP = TEMP/L
    LET DIRCOS(K) = TEMP
    LET TEMP = ARCCOS(TEMP)
    LET DIRANGLE(K) = TEMP
END OF LOOP
WRITE DIRCOS DIRANGLE
```