

POLYNOMIAL EVALUATION

PURPOSE

Carry out the evaluation of a polynomial with real coefficients for each point in a variable.

SYNTAX

LET <v3> = POLYNOMIAL EVALUATION <v1> <v2> <SUBSET/EXCEPT/FOR qualification>

where <v1> is the variable whose elements are the ordered real coefficients of the polynomial;

<v2> is the variable whose elements are the values at which the polynomial is to be evaluated;

<v3> is the variable whose elements are the computed values of the polynomial;

and where the <SUBSET/EXCEPT/FOR qualification> is optional and rarely used in this context.

EXAMPLES

LET Y = POLYNOMIAL EVALUATION C X

NOTE

The first element of the variable is the coefficient of the constant term, the second element is the coefficient of the linear term, the third element is the coefficient of the quadratic term, the fourth element is the coefficient of the cubic term, and so on. Thus the polynomial $4 + 11*X + 37*X^2 + 8*X^3 + 19*X^4$ can be stored in the variable Y with the following command:

```
LET Y = DATA 4 11 37 8 19
```

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

LET	=	Evaluates general functions.
POLYNOMIAL ADDITION	=	Carries out a polynomial addition.
POLYNOMIAL SUBTRACTION	=	Carries out a polynomial subtraction.
POLYNOMIAL MULTIPLICATION	=	Carries out a polynomial multiplication.
POLYNOMIAL DIVISION	=	Carries out a polynomial division.
POLYNOMIAL SQUARE	=	Carries out a polynomial square.
COMPLEX ROOTS	=	Computes the roots of a complex polynomial.
PLOT	=	Plots data or functions

APPLICATIONS

Mathematics

IMPLEMENTATION DATE

87/10

PROGRAM

```
. PURPOSE--DETERMINE THE COMPLEX ROOTS OF THE POLYNOMIAL
.   1.2 + 3.55*X + 12.25*X**2 + 7.33*X**3
.   + 14.2377*X**4 -10.752*X**5 + 5.42*X**6
. NOTE--FOR TESTING PURPOSES, THE ROOTS ARE
.   -0.1977768  -0.6085631
.   -0.1977768   0.6085631
.   -0.1802901  -0.3198090
.   -0.1802901   0.3198091
.   1.369949    1.461156
.   1.369949   -1.461156
. STEP 1--DEFINE THE COEFFICIENTS OF THE POLYNOMIAL
LET P = DATA 1.2 3.55 12.25 7.33 14.2377 -10.752 5.42
. STEP 2--DEFINE A SEQUENCE OF POINTS, EVALUATE THE POLYNOMIAL AT
.   THOSE POINTS, PLOT THE EVALUATED POLYNOMIAL.
LET X = SEQUENCE -1 .1 1
LET Y = POLYNOMIAL EVALUATION P X
MULTIPLY 2 1; MULTIPLY CORNER COORDINATES 0 0 100 100
TITLE ORIGINAL FUNCTION
PLOT Y X
. STEP 3--FIND AND PLOT THE COMPLEX ROOTS
LET X2 Y2 = COMPLEX ROOTS P
CHAR X
LINES
X1LABEL REAL COMPONENT
Y1LABEL COMPLEX COMPONENT
GRID ON
TITLE ROOTS OF FUNCTION
PLOT Y2 X2
END OF MULTIPLY
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