RF

PURPOSE
Compute Carlson's elliptic integral of the first kind.

DESCRIPTION
Carlson's elliptic integral of the first kind is defined as:

$$RF(x, y, z) = \frac{1}{2} \int_0^\infty \frac{1}{\sqrt{(t + x)(t + y)(t + z)}} dt \qquad \textbf{(EQ Aux-301)}$$

The parameters x, y, and z must all be non-negative with at most one of them being zero.

SYNTAX
LET <a> = RF(<x>,<y>,<z>)   <SUBSET/EXCEPT/FOR qualification>
where <x> is a non-negative number, parameter, or variable;
    <y> is a non-negative number, parameter, or variable;
    <z> is a non-negative number, parameter, or variable;
    <a> is a variable or a parameter (depending on what <x>, <y>, and <z> are) where the computed values are stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
LET A = RF(2,1,3)
LET A = RF(X,0,4)
LET X2 = RF(1,1,Y)

NOTE 1
The Carlson elliptic integrals are computed using the RC, RD, RF, and RJ routines from the SLATEC Common Mathematical Library. SLATEC is a large set of high quality, portable, public domain Fortran routines for various mathematical capabilities maintained by seven federal laboratories.

NOTE 2
DATAPLOT computes Legendre elliptic integrals by computing the equivalent Carlson elliptic integrals. See the documentation for the ELLIP1, ELLIP2, ELLIP3, ELLIPC1, and ELLIPC2 functions for details on computing Legendre elliptic functions in DATAPLOT.

DEFAULT
None

SYNONYMS
None

RELATED COMMANDS
RC	=	Compute the degenerate Carlson elliptic integral.
RD	=	Compute the Carlson elliptic integral of the second kind.
RF	=	Compute the Carlson elliptic integral of the first kind.
RJ	=	Compute the Carlson elliptic integral of the third kind.
ELLIPC1	=	Compute the Legendre complete elliptic integral of the first kind.
ELLIPC2	=	Compute the Legendre complete elliptic integral of the second kind.
ELLIP1	=	Compute the Legendre elliptic integral of the first kind.
ELLIP2	=	Compute the Legendre elliptic integral of the second kind.
ELLIP3	=	Compute the Legendre's elliptic integral of the third kind.

REFERENCE
"Algorithms for Incomplete Elliptic Integrals by Duplication," Carlson, ACM Transactions on Mathematical Software, 7, pp. 398-403.

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegun, National Bureau of Standards, 1964 (chapter 17).

APPLICATIONS
    Special Functions

IMPLEMENTATION DATE
    94/9

PROGRAM
    TITLE CARLSON ELLIPTIC FUNCTIONS
    LINE SOLID DASH DOT
    MULTIPLOT 2 2; MULTIPLOT CORNER COORFINATES 0 0 100 100
    PLOT RF(X,1,2) FOR X = 0.1 0.1 10 AND
    PLOT RF(X,0.2,0.5) FOR X = 0.1 0.1 10 AND
    PLOT RF(X,0.5,2) FOR X = 0.1 0.1 10
    .
    PLOT RF(1,X,2) FOR X = 0.1 0.1 10 AND
    PLOT RF(0.2,X,0.5) FOR X = 0.1 0.1 10 AND
    PLOT RF(0.5,X,2) FOR X = 0.1 0.1 10
    .
    PLOT RF(1,2,X) FOR X = 0.1 0.1 10 AND
    PLOT RF(0.2,0.5,X) FOR X = 0.1 0.1 10 AND
    PLOT RF(0.5,2,X) FOR X = 0.1 0.1 10
    .
    LINE SOLID ALL
    3-D PLOT RF(X,Y,0.2) FOR X = 0.1 0.1 3 FOR Y = 0.1 0.1 3
    END OF MULTIPLOT