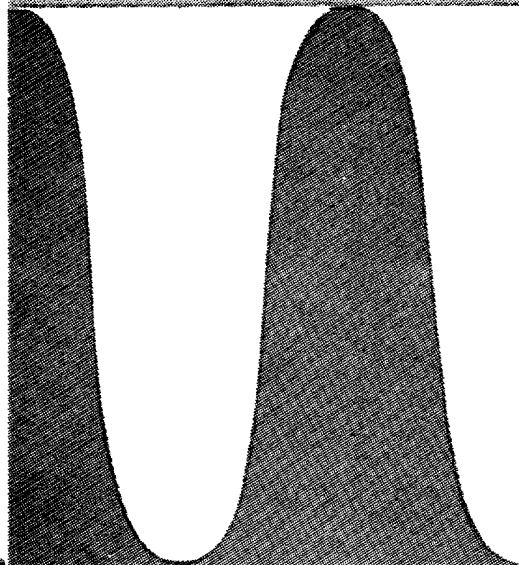


THE UNIVERSITY
OF WISCONSIN
madison, wisconsin



A PROGRAM FOR THE SOLUTION OF DIFFERENTIAL
EQUATIONS USING INTERVAL ARITHMETIC
(DIFEQ)

For the CDC 3600 and 1604

J. A. Braun and R. E. Moore

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MRC Technical Summary Report #901
June 1968

UNITED STATES ARMY

MATHEMATICS RESEARCH CENTER



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ABSTRACT

A practical implementation of the techniques of interval analysis developed by Professor R. E. Moore (Interval Analysis, Prentice-Hall, 1966) is described for solving systems of differential equations on the CDC 3600 and 1604.

A PROGRAM FOR THE SOLUTION OF DIFFERENTIAL
EQUATIONS USING INTERVAL ARITHMETIC

(DIFEQ)

For the CDC 3600 and 1604

J. A. Braun and R. E. Moore

Purpose

To provide a numerical solution, together with machine computed error bounds, for systems of N first order differential equations. Error bounding is rigorous, completely automatic and includes truncation errors, round-off errors and errors in initial data. This package is designed for use with FORTRAN. For a full description of the theory behind DIFEQ, see [1]

Input

The first two data cards contain respectively, in I3 format, the size, N , of the system and the number of terms $NDER$, to be taken in the Taylor expansion. The next three data cards contain respectively, in E20.8 format, the starting value $TSTART$, of the independent variable, the final value, $TFINAL$, of the independent variable and the printing interval $DELTAT$ of the independent variable. The next set of data cards contains the system of equations, subject to the rules contained in Formulae below. The final data cards contain, in C(E20.8, E20.8) format, the initial conditions, given as intervals — degenerate or otherwise — and appearing in the order y_1, y_2, y_3 , etc.

See EXAMPLES below for illustrations.

Program DIFEQ is written for use with FORTRAN 63 on the CDC 3600 and 1604.

Sponsored by the Mathematics Research Center, United States Army, Madison, Wisconsin, under Contract No. : DA-31-124-ARO-D-462.

Formulae

The system of equations is to be given in strings of first order equations, all equations ending with a terminating character "\$" . One must supply N[†] equations defining the dependent variables. A dependent variable name is a string of two or three alphanumeric characters, the first of which must be a Y . The name of the derivative of the dependent variable is like the dependent variable with the exception that the first character must be a D . In the equations all variable names, operator names, left parentheses, right parentheses, termination characters (i.e. \$) and equality signs must be separated from each other by at least one blank, (subsequent blanks will be ignored) and contain no blanks within themselves. As usual, columns 73-80 will be ignored.

If a parameter is to be used its name must be any string of one, two or three letters the first of which must be an M, (e.g. MU). A shorthand variable may be used and its name may be any string of one, two, or three letters, the first of which is not a Y,D, or M . All constants may appear signed or unsigned in Integer, E or F format. All of these cards will be read in until N dependent variables have been read in. The equations may be strung out over many cards, or several formulas may appear on one card. The termination character signifies the end of one equation and the end of a card has no real significance.

EXAMPLES

1.) PROBLEM: $\frac{dy}{dx} = 2y, y(0) = 1$

```
INPUT DATA DECK: 001
                   010
                   0.0
                   0.1
                   D1 = 2 * Y1 $
                   1.0
```

† N equals the size of the system.

These cards correspond respectively to:

N, Size of system;

NDER, Number of Taylor series terms to be used;

TSTART, Initial value of x ;

TFINAL, Final value of x ;

DELTAT, Print interval;

The Differential Equation ;

Initial value of y .

2.)

PROBLEM: $\frac{dy}{dx} = y^2$ $y(0) = 1$

INPUT DATA DECK: 001
 010
 0.0
 1.0
 0.1
 D1 = Y1 ** 2 \$
 1.0

3.)

PROBLEM: $\ddot{x}_1 - 2\dot{x}_2 = x_1 - \frac{\mu(x_1 - 1 + \mu)}{r^3} - \frac{(1 - \mu)(x_1 + \mu)}{R^3}$

$$\ddot{x}_2 + 2\dot{x}_1 = x_2 - \frac{\mu x_2}{r^3} - \frac{(1 - \mu)x_2}{R^3}$$

$$r = \{(x_1 - 1 + \mu)^2 + x_2^2\}^{1/2}$$

$$R = \{(x_1 + \mu)^2 + x_2^2\}^{1/2}$$

INPUT DATA DECK:

004

010

0.0

2.2234346E-04

2.2234346E-04

MU = .01215 \$

SMR = ((Y1 - 1 + MU) ** 2 + Y2 ** 2) ** .5 \$

BGR = ((Y1 + MU) ** 2 + Y2 ** 2) ** .5 \$

D1 = Y3 \$

D2 = Y4 \$

D3 = 2 * Y4 + Y1 - MU * (Y1 - 1 + MU) / SMR ** 3 - (1 - MU) *
(Y1 + MU) / BGR ** 3 \$

D4 = -2 * Y3 + Y2 - MU * Y2 / SMR ** 3 - (1 - MU) * Y2 / BGR ** 3 \$

-1.7641402E-02

-1.6018386E-02

9.8544878E 00

-4.1519712E 00

Output

The output will be as follows:

The equations will be printed as they were read in, followed by the list of initial conditions and their errors. Then for each printing interval, DELTAT, (specified on the fifth data card), the following will be printed: the real time elapsed since the last print statement, the total real time elapsed, T, the present value of the independent variable solution (s) at that value, and their associated errors.

Printing will stop when the solution at the final value of the independent variable TFINAL has been printed, see examples.

The following messages may occur:

SOLUTION IS A CONSTANT, when such is the case. When the solution is a polynomial - its coefficients will be printed. Delta T = 0 will be printed when a solution cannot be obtained at a given value of the independent value, and the program will terminate.

OUTPUT

Formulas compiled are

D1 = 2 * Y1 \$

Initial conditions at T =

Y1 = 1.000000000E 00

Solution at T = 1.0000000E-01

Y1 = 1.2214027582E 00

Solution at T = 2.0000000E-01

Y1 = 1.4918246976E 00

Solution at T = 3.0000000E-01

Y1 = 1.8221188004E 00

Solution at T = 4.0000000E-01

Y1 = 2.2255409285E 00

Solution at T = 5.0000000E-01

Y1 = 2.7182818284E 00

Solution at T = 6.0000000E-01

Y1 = 3.3201169228E 00

Solution at T = 7.0000000E-01

Y1 = 4.0551999670E 00

Solution at T = 8.0000000E-01

Y1 = 4.9530324248E 00

Solution at T = 9.0000000E-01

Y1 = 6.0496474648E 00

Solution at T = 1.0000000E 00

Y1 = 7.3890560995E 00

0

Error =

Time since last print = .63 seconds, total elapsed time = .63 seconds.

Error = 2.910E-11

Time since last print = .77 seconds, total elapsed time = 1.40 seconds.

Error = 5.821E-11

Time since last print = .75 seconds, total elapsed time = 2.15 seconds.

Error = 8.731E-11

Time since last print = .75 seconds, total elapsed time = 2.90 seconds.

Error = 1.164E-10

Time since last print = .77 seconds, total elapsed time = 3.67 seconds.

Error = 1.746E-10

Time since last print = 1.42 seconds, total elapsed time = 5.08 seconds.

Error = 2.910E-10

Time since last print = .75 seconds, total elapsed time = 5.83 seconds.

Error = 4.657E-10

Time since last print = .75 seconds, total elapsed time = 6.58 seconds.

Error = 5.821E-10

Time since last print = .77 seconds, total elapsed time = 7.35 seconds.

Error = 8.149E-10

Time since last print = .75 seconds, total elapsed time = 8.10 seconds.

Error = 1.048E-09

All printed output appearing in this report was obtained from the CDC 1604.

OUTPUT

Formulas compiled are

D1 = Y1 ** 2 \$

Initial conditions at T = 0

Y1 = 1.000000000E 00

Solution at T = 1.0000000E-01
Y1 = 1.111111111E 00

Solution at T = 2.0000000E-01
Y1 = 1.250000000E 00

Solution at T = 3.0000000E-01
Y1 = 1.4285714286E 00

Solution at T = 4.0000000E-01
Y1 = 1.6666666667E 00

Solution at T = 5.0000000E-01
Y1 = 2.000000000E 00

Solution at T = 6.0000000E-01
Y1 = 2.500000001E 00

Solution at T = 7.0000000E-01
Y1 = 3.333333335E 00

Solution at T = 8.0000000E-01
Y1 = 5.000000007E 00

Solution at T = 9.0000000E-01
Y1 = 1.0000000003E 01

Delta T = 0

0

Error = 0

Time since last print = 5.70 seconds, total elapsed time = 5.70 seconds.

Error = 5.821E-11

Time since last print = 4.12 seconds, total elapsed time = 9.82 seconds.

Error = 1.455E-10

Time since last print = 5.47 seconds, total elapsed time = 15.28 seconds.

Error = 2.619E-10

Time since last print = 5.47 seconds, total elapsed time = 20.75 seconds.

Error = 4.366E-10

Time since last print = 5.43 seconds, total elapsed time = 26.18 seconds.

Error = 6.985E-10

Time since last print = 8.18 seconds, total elapsed time = 34.37 seconds.

Error = 1.339E-09

Time since last print = 8.13 seconds, total elapsed time = 42.50 seconds.

Error = 2.619E-09

Time since last print = 12.18 seconds, total elapsed time = 54.68 seconds.

Error = 6.519E-09

Time since last print = 17.57 seconds, total elapsed time = 72.25 seconds.

Error = 2.771E-08

OUTPUT

Formulas compiled are

```

MU = .01215 $
SMR = ( ( Y1 - 1 + MU ) ** 2 + Y2 ** 2 ) ** .5 $
BGR = ( ( Y1 - MU ) ** 2 + Y2 ** 2 ) ** .5 $
D1 = Y3 $
D2 = Y4 $
D3 = Y4 $
D3 = 2 * Y4 + Y1 - MU * ( Y1 - 1 + MU ) / SMR ** 3 - ( 1 - MU ) *
( Y1 + MU ) / BGR ** 3 $
D4 = -2 * Y3 + Y2 - MU * Y2 / SMR ** 3 - ( 1 - MU ) * Y2 / BGR ** 3 $
    
```

Initial conditions at T = 0

```

Y1 = -1.9801200000E-02      Error = 0
Y2 = -1.5016200000E-02      Error = 0
Y3 = 9.5560067999E 00      Error = 0
Y4 = -4.8568780000E 00      Error = 0
    
```

Solution at T = 2.2234346E-04

```

Y1 = -1.7641401890E-02      Error = 9.095E-13
Y2 = -1.6018386585E-02      Error = 4.547E-13
Y3 = 9.8544877290E 00      Error = 6.985E-10
Y4 = -4.1519711651E 00      Error = 5.821E-10
    
```

Time since last print = 164.85 seconds, total elapsed time = 164.85 seconds.

Other Subroutines

The subroutine SEARCH has been omitted from the listing of DIFEQ because it is contained in the 1604 and 3600 libraries. Below is a listing of SEARCH if it is needed. It is a general table — lookup routine. The calling sequence is CALL SEARCH (N, TABLE, ARG, IND), where:

N is the number of entries to be searched;

TABLE is the name of the array to be scanned;

ARG is the argument we are searching for;

IND is the output parameter, which contains the ordinal of the argument in the table; IND is zero if ARG is not in the table.

```
SUBROUTINE SEARCH (K, A, S, N)
TYPE INTEGER A, S
DIMENSION A(K)
DO 10 I = 1, K
IF (S. EQ. A(I)) 11, 10
10 CONTINUE
N = 0
RETURN
11 N = I
END
```

REFERENCE

1. Moore, R. E., "Interval Analysis", Prentice-Hall, 1966.

Listing of DIFEQ for the CDC 1604 may be obtained by writing to

Mathematics Research Center
University of Wisconsin
Madison, Wisconsin 53706

Following is the listing of DIFEQ for the CDC 3600.

PROGRAM DIFEQ	DFQ	10
C THIS PROGRAM PRODUCES A NUMERICAL SOLUTION FOR A SYSTEM OF N	DFQ	20
C FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS WITH GIVEN	DFQ	30
C INITIAL CONDITIONS. THE SYSTEM IS ASSUMED TO BE AUTONOMOUS.	DFQ	40
C ERROR-BOUNDING IS RIGOROUS, COMPLETELY AUTOMATIC, AND INCLUDES	DFQ	50
C ROUND-OFF ERRORS. METHOD OF SOLUTION IS BY EXPANSION IN A	DFQ	60
C TAYLOR SERIES. COMPUTATION IS DONE USING INTERVAL ARITHMETIC.	DFQ	70
C	DFQ	80
C INPUT IS AS FOLLOWS.	DFQ	90
C 1) N (SIZE OF THE SYSTEM)	DFQ	100
C 2) NDER (NUMBER OF TERMS TO BE TAKEN IN THE TAYLOR EXPANSION)	DFQ	110
C 3) TSTART (STARTING VALUE OF THE INDEPENDENT VARIABLE)	DFQ	120
C 4) TFINAL (FINAL VALUE OF THE INDEPENDENT VARIABLE)	DFQ	130
C 5) DELTAT (PRINTING INTERVAL - RESULT WILL BE PRINTED FOR EACH	DFQ	140
C INCREMENT OF DELTAT IN THE INDEPENDENT VARIABLE)	DFQ	150
C 6) THE SYSTEM OF EQUATIONS, REPRESENTED BY FORTRAN-TYPE	DFQ	160
C STATEMENTS, EACH EQUATION TERMINATED BY \$	DFQ	170
C 7) THE INITIAL CONDITIONS, GIVEN AS INTERVALS (DEGENERATE OR	DFQ	180
C OTHERWISE).	DFQ	190
C	DFQ	200
C	DFQ	210
C TYPE IN5(2) Y,D,Q,T ,DELTAT,YOLD,PSEUDT,BBOX	DFQ	220
C COMMON Y,D,Q,T,NSYS,NDER	DFQ	230
C DIMENSION Y(31,12),D(31,12),Q(31,30),T(31,100),YOLD(31,12),	DFQ	240
C 1BBOX(12),YYOLD(31)	DFQ	250
C COMMON/OVERFLOW/INDCAT	DFQ	260
C COMMON/YOLD/YOLD	DFQ	270
C DIMENSION DT(2),YY(2,31,12),BB(2,12)	DFQ	280
C EQUIVALENCE(DT,DELTAT),(DELT,DT(2)),(Y,YY),(BBOX,BB)	DFQ	290
C DATA(DT=0.)	DFQ	300
C DATA (TWOM36=1.455E-11)	DFQ	310
C TYPE LOGICAL SW	DFQ	320
C READ 1,NSYS,NDER	DFQ	330
C 1 FORMAT(I3)	DFQ	340
C ND1=NDER+1	DFQ	350
C READ 2,TSTART,TFINAL,PRINTDEL	DFQ	360
C 2 FORMAT(E20.8)	DFQ	370
C CALL COMPILE(NSYS,NDER)	DFQ	380
C CALL ZCODEINT(Y,D,Q,T,62)	DFQ	390
C READ 3,((YY(I2,1,I1),I2=1,2),I1=1,NSYS)	DFQ	400
C 3 FORMAT((E20.8,E20.8))	DFQ	410
C	DFQ	420
C INITIALIZATION	DFQ	430
C DELT=POWER2(2.**(-36./(NDER-1)))	DFQ	440
C IF(DELT.EQ.0) GO TO 500	DFQ	450
C CALL PRINSTAR(TSTART,PRINTDEL)	DFQ	460

	SW=0	DFQ	470
	TIME=TSTART	DFQ	480
C		DFQ	490
C		DFQ	500
C	MAIN LOOP	DFQ	510
C		DFQ	520
C	COMPUTE THE FIRST (NDER-1) DERIVATIVES AT Y=YO	DFQ	530
100	CALL YSUPERK(NDER-1)	DFQ	540
	PSEUDT=0.	DFQ	550
C	OBTAIN NORM OF Y'	DFQ	560
	YNORM=FNORM(D,NSYS)	DFQ	570
	IF(YNORM.EQ.0) GO TO 500	DFQ	580
C	SAVE THE VALUES OF YO	DFQ	590
	DO 110 J1=1,NDER	DFQ	600
	DO 110 K1=1,NSYS	DFQ	610
110	YOLD(J1,K1)=Y(J1,K1)	DFQ	620
C		DFQ	630
C	OBTAIN B-BOX	DFQ	640
120	DO 130 K2=1,NSYS	DFQ	650
	Y(1,K2)=YOLD(1,K2)+YOLD(2,K2)*DELTAT/YNORM	DFQ	660
130	BBOX(K2)=Y(1,K2)	DFQ	670
C		DFQ	680
C	OBTAIN A-BOX	DFQ	690
140	INDCAT=0	DFQ	700
	CALL YSUPERK(NDER)	DFQ	710
	IF(INDCAT)150,160	DFQ	720
C		DFQ	730
C	CANNOT COMPUTE REMAINDER OVER B-BOX - HALVE B-BOX AND TRY AGAIN.	DFQ	740
150	DELT=POWER2(DELT/2.)	DFQ	750
	IF(DELT.EQ.0) GO TO 500	DFQ	760
	GO TO 120	DFQ	770
742	PRINT 743	DFQ	780
743	FORMAT(30X,30HTHERE IS A POLYNOMIAL SOLUTION)	DFQ	790
	PRINT 744	DFQ	800
744	FORMAT(50X,*2 N*)	DFQ	810
	PRINT 745	DFQ	820
745	FORMAT(* THE POLY IS OF THE FORM P(X)=A0+A1(X-X0)+A2(X-X0) +.....+DFQ	830	
	XAN(X-X0) *)	DFQ	840
	PRINT 746, TIME	DFQ	850
746	FORMAT(* WHERE X0=*F7.2)	DFQ	860
	PRINT 747	DFQ	870
747	FORMAT(* COEFF BELOW-CONSTANT TERM FIRST*)	DFQ	880
748	IF(YOLD(NDER,1).NE.0) GO TO 749	DFQ	890
	NDER=NDER-1	DFQ	900
	GO TO 748	DFQ	910
749	DO 800 J=1,NDER	DFQ	920

800	YYOLD(J)=YOLD(J,1)	DFQ 930
	PRINT 750,(YYOLD(J),J=1,NDER)	DFQ 940
750	FORMAT(5E20.8)	DFQ 950
	GO TO 500	DFQ 960
C		DFQ 970
C	COMPUTE A-BOX	DFQ 980
160	CALL EXPAND(DELTAT)	DFQ 990
C		DFQ 1000
C	TEST TO SEE IF A-BOX IS CONTAINED IN B-BOX	DFQ 1010
	DO 170 J3=1,NSYS	DFQ 1020
	IF((YY(1,1,J3).LT.BB(1,J3)).OR.(YY(2,1,J3).GT.BB(2,J3)))180,170	DFQ 1030
170	CONTINUE	DFQ 1040
	GO TO 300	DFQ 1050
C		DFQ 1060
C	A-BOX DOES NOT FIT INTO B-BOX -----TEST FLIP-FLOP	DFQ 1070
180	IF(SW)190,200	DFQ 1080
C		DFQ 1090
C	PROCEDURE I (SW ON) ----- FLIP SWITCH, HALVE DELTAT, RE-EVALUATE	ADFQ 1100
190	SW=0	DFQ 1110
	DELT=POWER2(DELT/2.)	DFQ 1120
	IF(DELT.EQ.0) GO TO 500	DFQ 1130
	GO TO 160	DFQ 1140
C		DFQ 1150
C	PROCEDURE II (SW OFF) ----- FLIP SW,REPLACE B BY A, COMPUTE DELT	DFQ 1160
200	SW=1	DFQ 1170
C	OBTAIN WIDTH OF YSUPERK(B)	DFQ 1180
	WIDTHB=0.	DFQ 1190
	DO 210 I3=1,NSYS	DFQ 1200
210	WIDTHB=MAX1F(WIDTHB,YY(2,NDER+1,I3)-YY(1,NDER+1,I3))	DFQ 1210
	IF(WIDTHB.EQ.0) GO TO 742	DFQ 1220
C	OBTAIN WIDTH OF YSUPERK(A)	DFQ 1230
	INDCAT=0	DFQ 1240
	CALL YSUPERK(NDER)	DFQ 1250
	IF(INDCAT)150,220	DFQ 1260
220	WIDTHA=0.	DFQ 1270
	DO 230 K3=1,NSYS	DFQ 1280
230	WIDTHA=MAX1F(WIDTHA,YY(2,NDER+1,K3)-YY(1,NDER+1,K3))	DFQ 1290
	IF(WIDTHA.EQ.0) GO TO 742	DFQ 1300
C	OBTAIN FUDGE-INTEGGER D	DFQ 1310
	KD=MAX1F(0.,(LOGF(WIDTHB)-LOGF(WIDTHA))/LOGF(DELT))	DFQ 1320
C	COMPUTE NEW DELT	DFQ 1330
	EXPFUD=1./FLOATF(KD+NDER-1)	DFQ 1340
	DELT=POWER2((TWOM36*YNORM/WIDTHB)**EXPFUD)	DFQ 1350
	IF(DELT.EQ.0) GO TO 500	DFQ 1360
C	SAVE B-BOX(THAT WAS A-BOX)	DFQ 1370
	DO 240 I4=1,NSYS	DFQ 1380

240	BBOX(I4)=Y(1,I4)	DFQ 1390
	GO TO 160	DFQ 1400
C		DFQ 1410
C	SUCCESSFUL BOUNDING OF REMAINDER ----- FINISH UP	DFQ 1420
C	----- GET BETTER BOUND ON REMAINDER TERM	DFQ 1430
300	CALL YSUPERK(NDER)	DFQ 1440
C	----- TEST FOR PRINTING (PRINT)	DFQ 1450
	CALL PRINTER(TIME,DELT)	DFQ 1460
C	STEP INDEPENDENT VARIABLE, AND TEST FOR END	DFQ 1470
310	TIME=TIME+DELT	DFQ 1480
	IF(TIME.GE.TFINAL)500,320	DFQ 1490
C	OBTAIN NEW BASE POINT Y0	DFQ 1500
320	PSEUDT=DELT	DFQ 1510
	CALL EXPAND (PSEUDT)	DFQ 1520
	GO TO 100	DFQ 1530
C		DFQ 1540
C	END	DFQ 1550
500	CONTINUE	DFQ 1560
	END	DFQ 1570
	SUBROUTINE YSUPERK(NDER)	DFQ 1580
	TYPE INT5(2) Y,D,Q,T	DFQ 1590
	COMMON Y(31,12),D(31,12),Q(31,30),T(31,100),N,K	DFQ 1600
	DO 1 J=1,NDER	DFQ 1610
	CALL DECODINT(J-1)	DFQ 1620
	DO 1 I=1,N	DFQ 1630
1	Y(J+1,I)=D(J,I)/J	DFQ 1640
	END	DFQ 1650
	SUBROUTINE EXPAND(T)	DFQ 1660
	TYPE INT5(2) Y,YOLD,T	DFQ 1670
	COMMON Y(31,12),OTHER(8804),NSYS,NDER	DFQ 1680
	COMMON/YOLD/YOLD(31,12)	DFQ 1690
	DO 1 I=1,NSYS	DFQ 1700
	Y(1,I)=Y(NDER+1,I)	DFQ 1710
	DO 1 J=1,NDER	DFQ 1720
	M=NDER-J+1	DFQ 1730
1	Y(1,I)=Y(1,I)*T+YOLD(M,I)	DFQ 1740
	END	DFQ 1750
	SUBROUTINE PRINTER(TIME,DELT)	DFQ 1760
	TYPE INT5(2) Y,PSEUDT	DFQ 1770
	COMMON Y(31,12),OTHER(8804),NSYS,NDER	DFQ 1780
	DIMENSION YY(2,31,12)	DFQ 1790
	EQUIVALENCE(Y,YY)	DFQ 1800
	KS=1	DFQ 1810
2	IF(TIME+DELT.GE.TLASTPR+PRDELT)1,100	DFQ 1820
1	TLASTPR=TLASTPR+PRDELT	DFQ 1830
	CURT=TIMEF(DUMMY)	DFQ 1840

ELT=(CURT-RTPL)/1000.	DFQ 1850
TEL=(CURT-RTIME)/1000.	DFQ 1860
RTPL=CURT	DFQ 1870
PSEUDT=TLASTPR-TIME	DFQ 1880
CALL EXPAND(PSEUDT)	DFQ 1890
PRINT 10,TLASTPR,ELT,TEL	DFQ 1900
10 FORMAT(15H0SOLUTION AT T=E15.7,5X,23HTIME SINCE LAST PRINT =F6.2,	DFQ 1910
1 31H SECONDS, TOTAL ELAPSED TIME = F7.2,9H SECONDS.)	DFQ 1920
50 DO 60 I=1,NSYS	DFQ 1930
X=Y(1,I)	DFQ 1940
E=YY(2,1,I)-X	DFQ 1950
PRINT 51,1,X,E	DFQ 1960
51 FORMAT(10X,1HY,I2,4X,1H=,E20.10,20X,7HERROR =E13.3)	DFQ 1970
60 CONTINUE	DFQ 1980
GO TO(2,100),KS	DFQ 1990
100 RETURN	DFQ 2000
ENTRY PRINSTAR	DFQ 2010
KS=2	DFQ 2020
TLASTPR=TIME	DFQ 2030
PRDELTA=DELTA	DFQ 2040
PRINT 61,TIME	DFQ 2050
61 FORMAT(27H0 INITIAL CONDITIONS AT T = F15.10)	DFQ 2060
RTIME=RTPL=TIMEF(DUMMY)	DFQ 2070
GO TO 50	DFQ 2080
END	DFQ 2090
FUNCTION FNORM(D,N)	DFQ 2100
DIMENSION D(2,31,12)	DFQ 2110
FNORM=0.	DFQ 2120
DO 1 I=1,N	DFQ 2130
1 FNORM=MAX1F(FNORM,ABSF(D(1,1,I)),ABSF(D(2,1,I)))	DFQ 2140
IF(FNORM.EQ.0.)2,10	DFQ 2150
2 PRINT 3	DFQ 2160
3 FORMAT(22H0SOLUTION IS CONSTANT.)	DFQ 2170
10 RETURN	DFQ 2180
END	DFQ 2190
FUNCTION POWER2(A)	DFQ 2200
DATA(TWO20=20254000000000000000B)	DFQ 2210
TYPE INTEGER Q	DFQ 2220
Q=A*TWO20	DFQ 2230
IF(Q)10,1	DFQ 2240
1 PRINT 2	DFQ 2250
2 FORMAT(13H0 DELTA T = 0)	DFQ 2260
POWER2=0 \$ RETURN	DFQ 2270
10 POWER2=FLOATF(Q)/TWO20	DFQ 2280
END	DFQ 2290
SUBROUTINE ZCODEINT(Z,D,Q,T,KSTOR)	DFQ 2300

DIMENSION Z(1),D(1),Q(1),T(1)	DFQ 2310
COMMON/ZLIST/ZCODE(1000)	DFQ 2320
COMMON/CONSTANT/C(51)	DFQ 2330
COMMON/ERASABLE/MCODE(60),LEX(31),KC,LCOM(300),LCVM(300),	DFQ 2340
1 LIBFUN(10),MORE(270),KTST	DFQ 2350
TYPE INTEGER ZCODE,ZC,SWL,SWR,OP,E,RV	DFQ 2360
DATA(MH=7777777700000000B),(ML=77777777B),(LS8=100000000B)	DFQ 2370
1 (LBLANK=60606060B)	DFQ 2380
ZC=0	DFQ 2390
KSIN=KTST	DFQ 2400
CALL STARTINT	DFQ 2410
DO 500 ND=1,KC	DFQ 2420
LV=LCVM(ND).AND.MH	DFQ 2430
RV=LCVM(ND).AND.ML	DFQ 2440
LV=LV/LS8	DFQ 2450
E=LCOM(ND).AND.ML	DFQ 2460
NE=NAD(E,Z,D,Q,T,KSTOR)	DFQ 2470
OP=LCOM(ND).AND.MH	DFQ 2480
SWL=LV=LV.AND.ML	DFQ 2490
IF(SWL.EQ.4R)8,9	DFQ 2500
8 SWL=0	DFQ 2510
GO TO 10	DFQ 2520
9 SWL=SWL.AND.77B	DFQ 2530
SWL=SWL-23B	DFQ 2540
NL=NAD(LV, Z,D,Q,T,KSTOR)	DFQ 2550
10 SWR=LCVM(ND).AND.77B	DFQ 2560
SWR=SWR-23B	DFQ 2570
NR=NAD(RV, Z,D,Q,T,KSTOR)	DFQ 2580
ZC=ZC+1	DFQ 2590
CALL SEARCH(2,LIBFUN,10,IND,OP)	DFQ 2600
IF(IND)20,11	DFQ 2610
11 CALL ERDIF	DFQ 2620
STOP	DFQ 2630
20 GO TO(110,120,130,140,150,160,170,180,190,200),IND	DFQ 2640
C	DFQ 2650
C ADDITION	DFQ 2660
110 IF(SWL)111,115	DFQ 2670
C LDA(INTERVAL) 2 NL	DFQ 2680
111 ZCODE(ZC)=MCODE(29)	DFQ 2690
ZC=ZC+1	DFQ 2700
ZCODE(ZC)=MCODE(3)+NL	DFQ 2710
IF(SWR)112,113	DFQ 2720
112 ZC=ZC+1	DFQ 2730
C FAD(INTERVAL) 2 NR	DFQ 2740
ZCODE(ZC)=MCODE(18)	DFQ 2750
ZC=ZC+1	DFQ 2760

	ZCODE(ZC)=MCODE(3)+NR	DFQ 2770
119	ZC=ZC+1	DFQ 2780
C	STA 2 NE	DFQ 2790
	ZCODE(ZC)=MCODE(19)	DFQ 2800
	ZC=ZC+1	DFQ 2810
	ZCODE(ZC)=MCODE(3)+NE	DFQ 2820
	GO TO 490	DFQ 2830
113	ZC=ZC+1	DFQ 2840
C	LIU 1 (J) IJP 1 **3	DFQ 2850
	ZCODE(ZC)=KRAMJN(MCODE(30),ZCODE(ZC+3))	DFQ 2860
1131	ZC=ZC+1	DFQ 2870
C	FAD(REAL) NR	DFQ 2880
	ZCODE(ZC)=MCODE(31)	DFQ 2890
	ZC=ZC+1	DFQ 2900
	ZCODE(ZC)=MCODE(4)+NR	DFQ 2910
	GO TO 119	DFQ 2920
115	IF(SWR)116,1119	DFQ 2930
1119	NT=NR	DFQ 2940
	NR=NL	DFQ 2950
	NL=NT	DFQ 2960
	GO TO 260	DFQ 2970
C	LDA (INTERVAL) NR	DFQ 2980
116	ZCODE(ZC)=MCODE(29)	DFQ 2990
	ZC=ZC+1	DFQ 3000
	ZCODE(ZC)=MCODE(3)+NR	DFQ 3010
	NR=NL	DFQ 3020
	IF(LV.EQ.LBLANK)119,113	DFQ 3030
118	IF(LV.EQ.LBLANK)1181,1131	DFQ 3040
1181	ZCODE(ZC-1)=ZCODE(ZC-1)-2	DFQ 3050
	GO TO 119	DFQ 3060
C		DFQ 3070
C	SUBTRACTION	DFQ 3080
120	IF(SWL)121,125	DFQ 3090
C	LDA(INTERVAL)2 NL	DFQ 3100
121	ZCODE(ZC)=MCODE(29)	DFQ 3110
	ZC=ZC+1	DFQ 3120
	ZCODE(ZC)=MCODE(3)+NL	DFQ 3130
	IF(SWR)122,123	DFQ 3140
122	ZC=ZC+1	DFQ 3150
C	FSB(INTERVAL) 2 NR	DFQ 3160
	ZCODE(ZC)=MCODE(32)	DFQ 3170
	ZC=ZC+1	DFQ 3180
	ZCODE(ZC)=MCODE(3)+NR	DFQ 3190
	GO TO 119	DFQ 3200
123	ZC=ZC+1	DFQ 3210
C	LIU 1 (J) IJP 1 **3	DFQ 3220

	ZCODE(ZC)=KRAMDN(MCODE(30),ZCODE(ZC+3))	DFQ 3230
1231	ZC=ZC+1	DFQ 3240
C	FSB (REAL) NR	DFQ 3250
	ZCODE(ZC)=MCODE(33)	DFQ 3260
	ZC=ZC+1	DFQ 3270
	ZCODE(ZC)=MCODE(4)+NR	DFQ 3280
	GO TO 119	DFQ 3290
125	IF(SWR)126,260	DFQ 3300
C	LAC(INTERVAL) 2 NR	DFQ 3310
126	ZCODE(ZC)=MCODE(58)	DFQ 3320
	ZC=ZC+1	DFQ 3330
	ZCODE(ZC)=MCODE(3)+NR	DFQ 3340
	NR=NL	DFQ 3350
	IF (LV .EQ. LBLANK) 119,113	DFQ 3360
C	LAC(REAL) NR	DFQ 3370
128	ZCODE(ZC-1)=MCODE(12)	DFQ 3380
	ZCODE(ZC)=MCODE(4)+NR	DFQ 3390
	NR=NL	DFQ 3400
	IF(LV.EQ.LBLANK)1181,1131	DFQ 3410
C		DFQ 3420
C	MULTIPLICATION	DFQ 3430
130	IF(SWL)131,135	DFQ 3440
131	IF(SWR)132,133	DFQ 3450
132	KSW1=0	DFQ 3460
	SW2=1.	DFQ 3470
	KSW3=MCODE(23)	DFQ 3480
	KSW5=0	DFQ 3490
	ZCODE(ZC)=MCODE(49)	DFQ 3500
	GO TO 250	DFQ 3510
C	LDA (REAL) NR	DFQ 3520
133	ZCODE(ZC)=MCODE(28)	DFQ 3530
	ZC=ZC+1	DFQ 3540
	ZCODE(ZC)=MCODE(4)+NR	DFQ 3550
134	ZC=ZC+1	DFQ 3560
C	FMU(INTERVAL)2 NL	DFQ 3570
	ZCODE(ZC)=MCODE(34)	DFQ 3580
	ZC=ZC+1	DFQ 3590
	ZCODE(ZC)=MCODE(3)+NL	DFQ 3600
	GO TO 119	DFQ 3610
135	IF(SWR)136,260	DFQ 3620
136	NTEMP=NL	DFQ 3630
	NL=NR	DFQ 3640
	NR=NTEMP	DFQ 3650
	GO TO 133	DFQ 3660
138	ZC=ZC+1	DFQ 3670
C	FMU (REAL) NR	DFQ 3680

	ZCODE(ZC)=MCODE(35)	DFQ 3690
	ZC=ZC+1	DFQ 3700
	ZCODE(ZC)=MCODE(4)+NR	DFQ 3710
	GO TO 119	DFQ 3720
C		DFQ 3730
C	DIVISION	DFQ 3740
140	IF(SWR)141,146	DFQ 3750
C	LIL 1 (2J) IJP 1 **1	DFQ 3760
141	ZCODE(ZC)=KRAMDN(MCODE(36),ZCODE(ZC+1))	DFQ 3770
	ZC=ZC+1	DFQ 3780
C	IJP 1 **4	DFQ 3790
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+4))	DFQ 3800
	ZC=ZC+1	DFQ 3810
	KSW1=0	DFQ 3820
	SW2=0	DFQ 3830
	KSW3=MCODE(23)	DFQ 3840
	KSW5=2	DFQ 3850
	IF(SWL)142,143	DFQ 3860
C	LDA (INTERVAL) NL	DFQ 3870
142	ZCODE(ZC)=MCODE(29)	DFQ 3880
	ZC=ZC+1	DFQ 3890
	ZCODE(ZC)=MCODE(3)+NL	DFQ 3900
	ZC=ZC+1	DFQ 3910
C	SLJ **16	DFQ 3920
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+16))	DFQ 3930
	NTEMP=NL	DFQ 3940
	NL=NE	DFQ 3950
	GO TO 250	DFQ 3960
C	LDA (REAL) NL	DFQ 3970
143	ZCODE(ZC)=MCODE(28)	DFQ 3980
	ZC=ZC+1	DFQ 3990
	ZCODE(ZC)=MCODE(4)+NL	DFQ 4000
	ZC=ZC+1	DFQ 4010
C	SLJ **14	DFQ 4020
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+14))	DFQ 4030
	NL=NE	DFQ 4040
	GO TO 250	DFQ 4050
145	IF(SWL)1451,1452	DFQ 4060
1451	ZC=ZC+1	DFQ 4070
C	FAD (INTERVAL) 2 NL	DFQ 4080
	ZCODE(ZC)=MCODE(18)	DFQ 4090
	ZC=ZC+1	DFQ 4100
	ZCODE(ZC)=MCODE(3)+NTEMP	DFQ 4110
1452	ZC=ZC+1	DFQ 4120
C	FDV (INTERVAL) NR	DFQ 4130
	ZCODE(ZC)=MCODE(39)	DFQ 4140

	ZC=ZC+1	DFQ 4150
	ZCODE(ZC)=MCODE(4)+NR	DFQ 4160
	GO TO 119	DFQ 4170
146	IF(SWL)147,260	DFQ 4180
147	ZC=ZC+1	DFQ 4190
C	LDA (INTERVAL) 2 NL	DFQ 4200
	ZCODE(ZC)=MCODE(29)	DFQ 4210
	ZC=ZC+1	DFQ 4220
	ZCODE(ZC)=MCODE(3)+NL	DFQ 4230
148	ZC=ZC+1	DFQ 4240
C	FDV (REAL) NR	DFQ 4250
	ZCODE(ZC)=MCODE(40)	DFQ 4260
	ZC=ZC+1	DFQ 4270
	ZCODE(ZC)=MCODE(4)+NR	DFQ 4280
	GO TO 119	DFQ 4290
C		DFQ 4300
C	X**Y,WHERE Y IS CONSTANT	DFQ 4310
150	IF(SWL)152,260	DFQ 4320
152	K2=RV/100B	DFQ 4330
	EXPON=C(K2)	DFQ 4340
	KEX=EXPON	DFQ 4350
	EXPIT=KEX	DFQ 4360
	IF((EXPON.EQ.EXPIT).AND.(KEX.GE.0))155,151	DFQ 4370
155	IF(KEX-1)1591,1592,156	DFQ 4380
156	SWK=0	DFQ 4390
	NP=NL	DFQ 4400
	NET=NE	DFQ 4410
157	KET=KEX	DFQ 4420
	KEX=KEX/2	DFQ 4430
	IF(KET.EQ.KEX*2)1576,1571	DFQ 4440
1571	IF(SWK)1572,1575	DFQ 4450
1572	NL=NP	DFQ 4460
	NR=NY1	DFQ 4470
	IF(KEX)1573,1574	DFQ 4480
1573	KSIN=KSIN+1	DFQ 4490
	K1=(KSIN-1)*KSTOR+1	DFQ 4500
	NE=NY1=KRAMDN(0,T(K1))	DFQ 4510
	IND=1	DFQ 4520
	GO TO 132	DFQ 4530
1574	NE=NET	DFQ 4540
	IND=3	DFQ 4550
	GO TO 132	DFQ 4560
1575	NY1=NP	DFQ 4570
	SWK=1.	DFQ 4580
	GO TO 1576	DFQ 4590
1576	NL=NR=NP	DFQ 4600

	IF((KEX.EQ.1).AND.(SWK.EQ.0.))1574,1577	DFQ 4610
1577	KSIN=KSIN+1	DFQ 4620
	K1=(KSIN-1)*KSTOR+1	DFQ 4630
	NE=NP=KRAMDN(0,T(K1))	DFQ 4640
	IND=2	DFQ 4650
	GO TO 132	DFQ 4660
1591	NL=KRAMDN(0,C(2))	DFQ 4670
	IND=1	DFQ 4680
	LV=LBLANK	DFQ 4690
	GO TO 260	DFQ 4700
1592	LV=LBLANK	DFQ 4710
	NR=NL	DFQ 4720
	GO TO 116	DFQ 4730
C	LIL 1 (2J) IJP 1 *+6 \	DFQ 4740
151	ZCODE(ZC)=KRAMDN(MCODE(36),ZCODE(ZC+6))	DFQ 4750
	ZC=ZC+1	DFQ 4760
C	ISK 0 ZRO X	DFQ 4770
	ZCODE(ZC)=MCODE(41)	DFQ 4780
	ZC=ZC+1	DFQ 4790
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+3))	DFQ 4800
	ZC=ZC+1	DFQ 4810
C	RTJ(EXPREAL) ZRO Y	DFQ 4820
	ZCODE(ZC)=MCODE(4)+NL	DFQ 4830
	ZC=ZC+1	DFQ 4840
	ZCODE(ZC)=MCODE(4)+NR	DFQ 4850
	ZC=ZC+1	DFQ 4860
C	SLJ *+17	DFQ 4870
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+17))	DFQ 4880
	ZC=ZC+1	DFQ 4890
C	RTJ COM3 ZRO NR	DFQ 4900
	ZCODE(ZC)=MCODE(42)+NR	DFQ 4910
	KSW1=0	DFQ 4920
	SW2=1	DFQ 4930
	KSW3=MCODE(22)	DFQ 4940
	KSW5=2	DFQ 4950
	NR=NL	DFQ 4960
	NL=NE	DFQ 4970
	GO TO 250	DFQ 4980
158	ZCODE(ZC-1)=MCODE(43)+NL	DFQ 4990
	ZCODE(ZC-2)=ZCODE(ZC-2)-2	DFQ 5000
	ZCODE(ZC)=NR	DFQ 5010
	GO TO 119	DFQ 5020
C		DFQ 5030
C	Z=LOG(X)	DFQ 5040
160	IF(SWR)161,260	DFQ 5050
C	LIL 1 (2J) IJP 1 *+1	DFQ 5060

161	ZCODE(ZC)=KRAMDN(MCODE(36),ZCODE(ZC+1))	DFQ 5070
	ZC=ZC+1	DFQ 5080
C	IJP 1 *#7	DFQ 5090
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+7))	DFQ 5100
	ZC=ZC+1	DFQ 5110
C	RTJ LOG5	DFQ 5120
	ZCODE(ZC)=MCODe(7)	DFQ 5130
	ZC=ZC+1	DFQ 5140
C	SLJ *+2	DFQ 5150
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 5160
	ZC=ZC+1	DFQ 5170
C	DLDA X	DFQ 5180
	ZCODE(ZC)=MCODE(4)+NR	DFQ 5190
	ZC=ZC+1	DFQ 5200
C	STA(INTERVAL) 2 Z	DFQ 5210
	ZCODE(ZC)=MCODE(19)	DFQ 5220
	ZC=ZC+1	DFQ 5230
	ZCODE(ZC)=MCODE(4)+NE	DFQ 5240
	ZC=ZC+1	DFQ 5250
C	SLJ *+25	DFQ 5260
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+25))	DFQ 5270
	ZC=ZC+1	DFQ 5280
C	IJP 1 *+4 PASS	DFQ 5290
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+4))	DFQ 5300
	ZC=ZC+1	DFQ 5310
C	LDA(INTERVAL) 2 X	DFQ 5320
	ZCODE(ZC)=MCODE(29)	DFQ 5330
	ZC=ZC+1	DFQ 5340
	ZCODE(ZC)=MCODE(3)+NR	DFQ 5350
	ZC=ZC+1	DFQ 5360
C	SLJ *+17	DFQ 5370
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+17))	DFQ 5380
	ZC=ZC+1	DFQ 5390
C	ENI 4 0 INI 1 -1	DFQ 5400
	ZCODE(ZC)=MCODe(50)	DFQ 5410
	KSW1=2	DFQ 5420
	SW2=0	DFQ 5430
	KSW3=MCODE(21)	DFQ 5440
	KSW5=2	DFQ 5450
	NL=NR	DFQ 5460
	NTEMP=NR	DFQ 5470
	NR=NE	DFQ 5480
	GO TO 250	DFQ 5490
164	NR=NL	DFQ 5500
	GO TO 1451	DFQ 5510
C	LDA X STA T+1	DFQ 5520

168	ZCODE(ZC-1)=MCODE(45)+NR*LS8	DFQ 5530
	ZCODE(ZC-2)=ZCODE(ZC-2)+1	DFQ 5540
C	STA T+2	DFQ 5550
	ZCODE(ZC)=MCODE(46)	DFQ 5560
	ZC=ZC+1	DFQ 5570
C	RTJ LOG5 (OR EXP5,SIN5,COS5,ATAN5)	DFQ 5580
	ZCODE(ZC)=MCODE(1+IND)	DFQ 5590
	ZC=ZC+1	DFQ 5600
C	SLJ *+2	DFQ 5610
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 5620
	ZC=ZC+1	DFQ 5630
C	DLDA T+1	DFQ 5640
	ZCODE(ZC)=MCODE(4)+T+1	DFQ 5650
	ZC=ZC+1	DFQ 5660
C	STA(INTERVAL) Z	DFQ 5670
	ZCODE(ZC)=MCODE(19)	DFQ 5680
	ZC=ZC+1	DFQ 5690
	ZCODE(ZC)=MCODE(4)+NE	DFQ 5700
	GO TO 490	DFQ 5710
C		DFQ 5720
C	Z=EXPF(X)	DFQ 5730
170	IF(SWR)171,260	DFQ 5740
C	LIL 1 (2J) IJP 1 *+1	DFQ 5750
171	ZCODE(ZC)=KRAMUN(MCODE(36),ZCODE(ZC+1))	DFQ 5760
	ZC=ZC+1	DFQ 5770
C	IJP 1 *+7	DFQ 5780
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+7))	DFQ 5790
	ZC=ZC+1	DFQ 5800
C	RTJ EXP5	DFQ 5810
	ZCODE(ZC)=MCODE(8)	DFQ 5820
	ZC=ZC+1	DFQ 5830
C	SLJ *+2	DFQ 5840
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 5850
	ZC=ZC+1	DFQ 5860
	DLDA X	DFQ 5870
	ZCODE(ZC)=MCODE(4)+NR	DFQ 5880
	ZC=ZC+1	DFQ 5890
C	STA(INTERVAL) Z	DFQ 5900
	ZCODE(ZC)=MCODE(19)	DFQ 5910
	ZC=ZC+1	DFQ 5920
	ZCODE(ZC)=MCODE(4)+NE	DFQ 5930
	ZC=ZC+1	DFQ 5940
C	SLJ *+15	DFQ 5950
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+15))	DFQ 5960
	ZC=ZC+1	DFQ 5970
C	ENI 4 0 PASS	DFQ 5980

	ZCODE(ZC)=MCODE(44)	DFQ 5990
	KSW1=0	DFQ 6000
	SW2=1.	DFQ 6010
	KSW3=MCODE(21)	DFQ 6020
	KSW5=2	DFQ 6030
	NL=NE	DFQ 6040
	GO TO 250	DFQ 6050
C		DFQ 6060
C	Z=SINF(X)	DFQ 6070
	180 IF(SWR)181,260	DFQ 6080
	181 KSIN=KSIN+1	DFQ 6090
	K1=(KSIN-1)*KSTOR+1	DFQ 6100
	NW=KRAMDN(0,T(K1))	DFQ 6110
C	LIL 1 (2J) IJP 1 **1	DFQ 6120
	182 ZCODE(ZC)=KRAMDN(MCODE(36),ZCODE(ZC+1))	DFQ 6130
	ZC=ZC+1	DFQ 6140
C	IJP 1 **12	DFQ 6150
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+12))	DFQ 6160
	ZC=ZC+1	DFQ 6170
C	RTJ SIN5	DFQ 6180
	ZCODE(ZC)=MCODE(9)	DFQ 6190
	ZC=ZC+1	DFQ 6200
C	SLJ **2	DFQ 6210
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 6220
	ZC=ZC+1	DFQ 6230
C	DLDA X	DFQ 6240
	ZCODE(ZC)=MCODE(4)+NR	DFQ 6250
	ZC=ZC+1	DFQ 6260
C	STA(INTERVAL) Z	DFQ 6270
	ZCODE(ZC)=MCODE(19)	DFQ 6280
	ZC=ZC+1	DFQ 6290
	ZCODE(ZC)=MCODE(4)+NE	DFQ 6300
	ZC=ZC+1	DFQ 6310
C	RTJ COS5	DFQ 6320
	ZCODE(ZC)=MCODE(10)	DFQ 6330
	ZC=ZC+1	DFQ 6340
C	SLJ **2	DFQ 6350
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 6360
	ZC=ZC+1	DFQ 6370
C	DLDA X	DFQ 6380
	ZCODE(ZC)=MCODE(4)+NR	DFQ 6390
	ZC=ZC+1	DFQ 6400
C	STA(INTERVAL) Z	DFQ 6410
	ZCODE(ZC)=MCODE(19)	DFQ 6420
	ZC=ZC+1	DFQ 6430
	ZCODE(ZC)=MCODE(4)+NW	DFQ 6440

	ZC=ZC+1	DFQ 6450
C	SLJ *+29	DFQ 6460
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+29))	DFQ 6470
	ZC=ZC+1	DFQ 6480
C	ENI 4 0 PASS	DFQ 6490
	ZCODE(ZC)=MCODE(44)	DFQ 6500
	KSW1=0	DFQ 6510
	SW2=1.	DFQ 6520
	KSW3=MCODE(21)	DFQ 6530
	KSW5=2	DFQ 6540
	NL=NW	DFQ 6550
	GO TO 250	DFQ 6560
185	IND=IND+1	DFQ 6570
	SW2=0.	DFQ 6580
	NL=NE	DFQ 6590
	NE=NW	DFQ 6600
	ZC=ZC+1	DFQ 6610
C	ENI 4 0 LIL 1 (2J-2)	DFQ 6620
	ZCODE(ZC)=MCODE(47)	DFQ 6630
	GO TO 250	DFQ 6640
C		DFQ 6650
C	Z=COSF(X)	DFQ 6660
190	IF(SWR)191,260	DFQ 6670
191	NW=NE	DFQ 6680
	KSIN=KSIN+1	DFQ 6690
	K1=(KSIN-1)*KSTOR+1	DFQ 6700
	NE=KRAMDN(0,T(K1))	DFQ 6710
	IND=IND-1	DFQ 6720
	GO TO 182	DFQ 6730
C		DFQ 6740
C	Z=ATAN(X)	DFQ 6750
200	IF(SWR)201,260	DFQ 6760
201	KSIN=KSIN+1	DFQ 6770
	K1=(KSIN-1)*KSTOR+1	DFQ 6780
	NV=KRAMDN(0,T(K1))	DFQ 6790
	KSIN=KSIN+1	DFQ 6800
	K1=(KSIN-1)*KSTOR+1	DFQ 6810
	NW=KRAMDN(0,T(K1))	DFQ 6820
C	LIL 1 (2J) IJP 1 *+1	DFQ 6830
	ZCODE(ZC)=KRAMDN(MCODE(36),ZCODE(ZC+1))	DFQ 6840
	ZC=ZC+1	DFQ 6850
C	IJP 1 *+21	DFQ 6860
	ZCODE(ZC)=KRAMUP(MCODE(37),ZCODE(ZC+21))	DFQ 6870
	ZC=ZC+1	DFQ 6880
C	RTJ ATAN5	DFQ 6890
	ZCODE(ZC)=MCODE(11)	DFQ 6900

	ZC=ZC+1	DFQ 6910
C	SLJ *+2	DFQ 6920
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+2))	DFQ 6930
	ZC=ZC+1	DFQ 6940
C	DLDA X	DFQ 6950
	ZCODE(ZC)=MCODE(4)+NR	DFQ 6960
	ZC=ZC+1	DFQ 6970
C	STA(INTERVAL) Z	DFQ 6980
	ZCODE(ZC)=MCODE(19)	DFQ 6990
	ZC=ZC+1	DFQ 7000
	ZCODE(ZC)=MCODE(4)+NE	DFQ 7010
	ZC=ZC+1	DFQ 7020
C	LDA(INTERVAL) X	DFQ 7030
	ZCODE(ZC)=MCODE(29)	DFQ 7040
	ZC=ZC+1	DFQ 7050
	ZCODE(ZC)=MCODE(3)+NR	DFQ 7060
	ZC=ZC+1	DFQ 7070
C	FMU(INTERVAL) X	DFQ 7080
	ZCODE(ZC)=MCODE(34)	DFQ 7090
	ZC=ZC+1	DFQ 7100
	ZCODE(ZC)=MCODE(3)+NR	DFQ 7110
	ZC=ZC+1	DFQ 7120
C	FAD(REAL) 1.	DFQ 7130
	ZCODE(ZC)=MCODE(31)	DFQ 7140
	ZC=ZC+1	DFQ 7150
	ZCODE(ZC)=MCODE(4)+1	DFQ 7160
	ZC=ZC+1	DFQ 7170
C	STA V	DFQ 7180
	ZCODE(ZC)=MCODE(19)	DFQ 7190
	ZC=ZC+1	DFQ 7200
	ZCODE(ZC)=MCODE(3)+NV	DFQ 7210
	ZC=ZC+1	DFQ 7220
C	LDA(REAL) 1.	DFQ 7230
	ZCODE(ZC)=MCODE(28)	DFQ 7240
	ZC=ZC+1	DFQ 7250
	ZCODE(ZC)=MCODE(4)+1	DFQ 7260
	ZC=ZC+1	DFQ 7270
C	FDV(INTERVAL) V	DFQ 7280
	ZCODE(ZC)=MCODE(39)	DFQ 7290
	ZC=ZC+1	DFQ 7300
	ZCODE(ZC)=MCODE(4)+NV	DFQ 7310
	ZC=ZC+1	DFQ 7320
C	STA W	DFQ 7330
	ZCODE(ZC)=MCODE(19)	DFQ 7340
	ZC=ZC+1	DFQ 7350
	ZCODE(ZC)=MCODE(3)+NW	DFQ 7360

	ZC=ZC+1	DFQ 7370
C	SLJ *+47	DFQ 7380
	ZCODE(ZC)=KRAMUP(MCODE(38),ZCODE(ZC+47))	DFQ 7390
	ZC=ZC+1	DFQ 7400
C	INI 1 2 PASS	DFQ 7410
	ZCODE(ZC)=MCODE(48)	DFQ 7420
	NT=NE	DFQ 7430
	NL=NR	DFQ 7440
	NE=NV	DFQ 7450
	KSW1=0	DFQ 7460
	SW2=1	DFQ 7470
	KSW3=MCODE(23)	DFQ 7480
	KSW4=1	DFQ 7490
	KSW5=0	DFQ 7500
	GO TO 250	DFQ 7510
205	GO TO(206,207,490),KSW4	DFQ 7520
206	ZC=ZC+1	DFQ 7530
C	ENI 4 0 LIL 1 (2J-2)	DFQ 7540
	ZCODE(ZC)=MCODE(47)	DFQ 7550
	SW2=0.	DFQ 7560
	KSW4=2	DFQ 7570
	KSW5=2	DFQ 7580
	NT2=NR	DFQ 7590
	NL=NW	DFQ 7600
	NR=NV	DFQ 7610
	NE=NW	DFQ 7620
	GO TO 250	DFQ 7630
207	ZC=ZC+1	DFQ 7640
C	FDV (INTERVAL) V	DFQ 7650
	ZCODE(ZC)=MCODE(39)	DFQ 7660
	ZC=ZC+1	DFQ 7670
	ZCODE(ZC)=MCODE(4)+NV	DFQ 7680
	ZC=ZC+1	DFQ 7690
C	STA (INTERVAL) 2 W	DFQ 7700
	ZCODE(ZC)=MCODE(19)	DFQ 7710
	ZC=ZC+1	DFQ 7720
	ZCODE(ZC)=MCODE(3)+NW	DFQ 7730
	ZC=ZC+1	DFQ 7740
C	ENI 4 0 LIL 1 (2J-2)	DFQ 7750
	ZCODE(ZC)=MCODE(47)	DFQ 7760
	SW2=1	DFQ 7770
	NR=NT2	DFQ 7780
	NE=NT	DFQ 7790
	KSW3=MCODE(21)	DFQ 7800
	KSW4=3	DFQ 7810
	GO TO 250	DFQ 7820

C		DFQ 7830
C	MULTIPLICATION LOOP	DFQ 7840
250	ZC=ZC+1	DFQ 7850
C	1) ENA 0 ENI 3 (0 OR 2)	DFQ 7860
	ZCODE(ZC)=MCODE(13)+KSW5	DFQ 7870
	ZC=ZC+1	DFQ 7880
C	2) STA 2 NE STA 2 NE+1	DFQ 7890
	ZCODE(ZC)=MCODE(14)+NE*100000001B	DFQ 7900
	ZC=ZC+1	DFQ 7910
	IF(SW2)251,252	DFQ 7920
C	3) LDA (OR LAC) 3-NR	DFQ 7930
251	ZCODE(ZC)=MCODE(15)	DFQ 7940
	ZC=ZC+1	DFQ 7950
	ZCODE(ZC)=MCODE(1)+NR	DFQ 7960
	GO TO 253	DFQ 7970
252	ZCODE(ZC)=MCODE(16)	DFQ 7980
	ZC=ZC+1	DFQ 7990
	ZCODE(ZC)=MCODE(1)+NR	DFQ 8000
253	ZC=ZC+1	DFQ 8010
C	4) FMU 1 NL	DFQ 8020
	ZCODE(ZC)=MCODE(17)	DFQ 8030
	ZC=ZC+1	DFQ 8040
	ZCODE(ZC)=MCODE(2)+NL+KSW1	DFQ 8050
	ZC=ZC+1	DFQ 8060
C	8) RTJ (COM1 OR COM2 OR **+1)	DFQ 8070
	ZCODE(ZC)=KSW3	DFQ 8080
	ZC=ZC+1	DFQ 8090
C	5) FAD 2 NE	DFQ 8100
	ZCODE(ZC)=MCODE(18)	DFQ 8110
	ZC=ZC+1	DFQ 8120
	ZCODE(ZC)=MCODE(3)+NE	DFQ 8130
	ZC=ZC+1	DFQ 8140
C	6) STA 2 NE	DFQ 8150
	ZCODE(ZC)=MCODE(19)	DFQ 8160
	ZC=ZC+1	DFQ 8170
	ZCODE(ZC)=MCODE(3)+NE	DFQ 8180
	ZC=ZC+1	DFQ 8190
C	7) INI 3 2 IJP 1 **+1	DFQ 8200
	ZCODE(ZC)=KRAMDN(MCODE(20),ZCODE(ZC+1))	DFQ 8210
	ZC=ZC+1	DFQ 8220
C	9) IJP 1 *-10	DFQ 8230
	ZCODE(ZC)=KRAMDN(MCODE(24),ZCODE(ZC-10))	DFQ 8240
	GO TO (2576,2157,490,145,1452,164,490,185,490,205),IND	DFQ 8250
2576	ZC=ZC+1	DFQ 8260
	GO TO 1576	DFQ 8270
2157	ZC=ZC+1	DFQ 8280

	GO TO 157	DFQ 8290
C		DFQ 8300
C	BOTH ARGUMENTS CONSTANT	DFQ 8310
C	1) ENQ 2 0 QJP *+3	DFQ 8320
C	260 ZCODE(ZC)=KRAMDN(MCODE(25),ZCODE(ZC+3))	DFQ 8330
C	2) ENA 0 STA 2 NE	DFQ 8340
	ZC=ZC+1	DFQ 8350
	ZCODE(ZC)=MCODE(26)+NE	DFQ 8360
	ZC=ZC+1	DFQ 8370
C	3) STA 2 NE+1 SLJ *+7	DFQ 8380
	ZCODE(ZC)=KRAMDN(MCODE(27),ZCODE(ZC+7))+NE*LS8	DFQ 8390
C	4) LDA NL (REAL)	DFQ 8400
	ZC=ZC+1	DFQ 8410
	ZCODE(ZC)=MCODE(28)	DFQ 8420
	ZC=ZC+1	DFQ 8430
	ZCODE(ZC)=MCODE(4)+NL	DFQ 8440
	GO TO (118,128,138,148,158,168,168,168,168,168),IND	DFQ 8450
C		DFQ 8460
C		DFQ 8470
	490 IF(ZC.GT.999)699,491	DFQ 8480
	491 IF(KSIN.GT.100)689,500	DFQ 8490
	500 CONTINUE	DFQ 8500
	ZC=ZC+1	DFQ 8510
C	SLJ EXIT	DFQ 8520
	ZCODE(ZC)=MCODE(51)	DFQ 8530
	RETURN	DFQ 8540
	689 CALL ERTST	DFQ 8550
	STOP	DFQ 8560
	699 CALL ERZCD	DFQ 8570
	STOP	DFQ 8580
	END	DFQ 8590
	IDENT DUMMYINT	DFQ 8600
	ENTRY DECODINT	DFQ 8610
	ENTRY STARTINT	DFQ 8620
	EXT Q1Q00550	DFQ 8630
	EXT Q1Q01550	DFQ 8640
	EXT Q1Q04550	DFQ 8650
	EXT Q1Q02550	DFQ 8660
	EXT Q1Q10550	DFQ 8670
	EXT Q1Q00510	DFQ 8680
	EXT Q1Q01510	DFQ 8690
	EXT Q1Q02510	DFQ 8700
	EXT Q1Q03550	DFQ 8710
	EXT Q1Q03510	DFQ 8720
	EXT Q1Q04510	DFQ 8730
	EXT Q1Q05550	DFQ 8740

	EXT	Q1Q05510		DFQ 8750
	EXT	Q2Q07551		DFQ 8760
	EXT	LOG5		DFQ 8770
	EXT	EXP5		DFQ 8780
	EXT	SIN5		DFQ 8790
	EXT	COS5		DFQ 8800
	EXT	ATAN5		DFQ 8810
ERASABLE	BLOCK	973		DFQ 8820
	COMMON	MASKSINT(60)		DFQ 8830
CONSTANT	BLOCK	51		DFQ 8840
	COMMON	C(51)		DFQ 8850
ZLIST	BLOCK	1000		DFQ 8860
	COMMON	ZCODE(1000)		DFQ 8870
	ORGR	*		DFQ 8880
DECODINT	SLJ	**		DFQ 8890
+	SIU	EXIT,1		DFQ 8900
	SIL	EXIT,2		DFQ 8910
	SIU	EXIT+1,3		DFQ 8920
	SIL	EXIT+1,4		DFQ 8930
	SIU	EXIT+2,5		DFQ 8940
	SIL	EXIT+2,6		DFQ 8950
	LIL	DECODINT,1	ADDRESS+1 OF CALL TO DECODE	DFQ 8960
	SIU	RETURN...,1		DFQ 8970
	INI	1,1		DFQ 8980
	LDA	0,1	ZRO(J) ENI 0	DFQ 8990
	ARS	24		DFQ 9000
	SAU	*+1	ADDRESS OF J	DFQ 9010
+	LDA	**	J TO A	DFQ 9020
	SAU	T	J TO UPPER OF T	DFQ 9030
	LIU	T,6	J TO 16	DFQ 9040
	INA	0,6		DFQ 9050
	SAL	T	2J TO LOWER OF T	DFQ 9060
	INA	-2		DFQ 9070
	SAL	T+5		DFQ 9080
	LIL	T,2	2J TO 12	DFQ 9090
	ENA	0,6		DFQ 9100
+	AJP,NZ	*+2	IS J = 0	DFQ 9110
	LDA	C+1	YES---	DFQ 9120
	STA	=SFACT	SET J-FACTORIAL = 1.	DFQ 9130
	SLJ	ZCODE		DFQ 9140
	LDA	C,6		DFQ 9150
	FMU	FACT	OBTAIN J-FACTORIAL	DFQ 9160
	STA	FACT		DFQ 9170
	SLJ	ZCODE		DFQ 9180
EXIT	ENI	** ,1	RESTORE	DFQ 9190
	ENI	** ,2	INDEX	DFQ 9200

	ENI	** , 3	REGISTERS	DFQ 9210
	ENI	** , 4		DFQ 9220
	ENI	** , 5		DFQ 9230
	ENI	** , 6		DFQ 9240
RETURN..	SLJ	**	EXIT	DFQ 9250
STARTINT	SLJ	**		DFQ 9260
+	SIU	EX2,1		DFQ 9270
	ENI	1,1		DFQ 9280
LOOPSTAR	LDA	M1-1,1		DFQ 9290
	STA	MASKSINT-1,1		DFQ 9300
	ISK	60,1		DFQ 9310
	SLJ	LOOPSTAR		DFQ 9320
EX2	ENI	** , 1		DFQ 9330
	SLJ	STARTINT		DFQ 9340
M1	DLDA	0,3		DFQ 9350
M2	DLDA	0,1		DFQ 9360
M3	DLDA	0,2		DFQ 9370
M4	DLDA	0		DFQ 9380
M5	DLDA	T+1		DFQ 9390
M6	DLDA	FACT		DFQ 9400
M7	BRTJ	(%)LOG5,,*		DFQ 9410
M8	BRTJ	(%)EXP5,,*		DFQ 9420
M9	BRTJ	(%)COS5,,*		DFQ 9430
M10	BRTJ	(%)SIN5,,*		DFQ 9440
M11	BRTJ	(%)ATAN5,,*		DFQ 9450
M12	BRTJ	(%)Q1Q01510,,*		DFQ 9460
M13	ENA	0	MULTIPLICATION LOOP	DFQ 9470
	ENI	0,3	SET I3 TO 0 OR 2	DFQ 9480
M14	STA	0,2	ZERO SUM	DFQ 9490
	STA	1,2		DFQ 9500
M15	BRTJ	(%)Q1Q00550,,*	LDA 3 NR	DFQ 9510
M16	BRTJ	(%)Q1Q01550,,*	(OR) LAC 3 NR	DFQ 9520
M17	BRTJ	(%)Q1Q04550,,*	FMU 1 NL	DFQ 9530
M18	BRTJ	(%)Q1Q02550,,*	FAD 2 NE	DFQ 9540
M19	BRTJ	(%)Q1Q10550,,*	STA 2 NE	DFQ 9550
M20	INI	2,3	INI 3 2	DFQ 9560
	IJP	0,1	INI 1 -1 (UNLESS ZERO)	DFQ 9570
M21	RTJ	COM1		DFQ 9580
M22	RTJ	COM2		DFQ 9590
M23	ENI	0		DFQ 9600
M24	ENI	0		DFQ 9610
	IJP	0,1	IJP 1 *-6 (TO M3)	DFQ 9620
M25	ENQ	0,2		DFQ 9630
	QJP,ZR	0		DFQ 9640
M26	ENA	0		DFQ 9650
	STA	0,2		DFQ 9660

M27	STA	1,2		DFQ 9670
	SLJ	0		DFQ 9680
M28	BRTJ	(\$)Q1Q00510,,*	LDA (REAL)	DFQ 9690
M29	BRTJ	(\$)Q1Q00550,,*	LDA 2 (INTERVAL)	DFQ 9700
M30	LIU	T,1		DFQ 9710
	IJP	0,1		DFQ 9720
M31	BRTJ	(\$)Q1Q02510,,*	FAD (REAL)	DFQ 9730
M32	BRTJ	(\$)Q1Q03550,,*	FSB 2 (INTERVAL)	DFQ 9740
M33	BRTJ	(\$)Q1Q03510,,*	FSB (REAL)	DFQ 9750
M34	BRTJ	(\$)Q1Q04550,,*	FMU 2 (INTERVAL)	DFQ 9760
M35	BRTJ	(\$)Q1Q04510,,*	FMU (REAL)	DFQ 9770
M36	LIL	T,1		DFQ 9780
	IJP	0,1		DFQ 9790
M37	IJP	0,1		DFQ 9800
M38	SLJ	0		DFQ 9810
M39	BRTJ	(\$)Q1Q05550,,*	FDV (INTERVAL)	DFQ 9820
M40	BRTJ	(\$)Q1Q05510,,*	FDV (REAL)	DFQ 9830
M41	BRTJ	(\$)Q2Q07551,,*		DFQ 9840
M42	RTJ	COM3		DFQ 9850
	ZRO	0		DFQ 9860
M43	RTJ	COM4		DFQ 9870
	ZRO	0		DFQ 9880
M44	ENI	0,4		DFQ 9890
M45	LDA	0		DFQ 9900
	STA	T+1		DFQ 9910
M46	STA	T+2		DFQ 9920
M47	ENI	0,4		DFQ 9930
	LIL	T+5,1		DFQ 9940
M48	INI	2,1		DFQ 9950
M49	LIL	T,1		DFQ 9960
M50	ENI	0,4		DFQ 9970
	INI	-1,1		DFQ 9980
M51	SLJ	EXIT		DFQ 9990
M52	LDA	0,2		DFQ10000
	AJP,NZ	0		DFQ10010
M53	FSB	C+1		DFQ10020
	STA	0,2		DFQ10030
M54	LDA	0,2		DFQ10040
	FMU	0,2		DFQ10050
M55	STA	0,2		DFQ10060
M56	BRTJ	(\$)Q1Q04510,,*		DFQ10070
M57	BRTJ	(\$)Q1Q05510,,*		DFQ10080
M58	BRTJ	(\$)Q1Q01550,,*		DFQ10090
COM1	SLJ	**	PART OF MULTIPLY LOOP	DFQ10100
+	INI	1,4	FOR OBTAINING (J-K)/J	DFQ10110
	BRTJ	(\$)Q1Q04510,,*		DFQ10120

	DFMU	C,4	FMU (J-K)	DFQ10130
	BRTJ	(\$)Q1Q05510,,*		DFQ10140
	DFDV	C,6	FDV (J)	DFQ10150
	SLJ	COM1		DFQ10160
COM2	SLJ	**	PART OF MULTIPLY LOOP	DFQ10170
+	INI	-1,5	FOR OBTAINING (C*(J-K)-K)/J	DFQ10180
COM21	BRTJ	(\$)Q1Q10550,,*		DFQ10190
	DSTA	T+1	STA(T+1)	DFQ10200
COM22	BRTJ	(\$)Q1Q00510,,*	LDA (C)	DFQ10210
	DLDA	**		DFQ10220
	BRTJ	(\$)Q1Q04510,,*	FMU (J-K)	DFQ10230
	DFMU	C,4		DFQ10240
	BRTJ	(\$)Q1Q03510,,*	FSB (K)	DFQ10250
	DFSB	C,5		DFQ10260
	BRTJ	(\$)Q1Q05510,,*	FDV (J)	DFQ10270
	DFDV	C,6		DFQ10280
	BRTJ	(\$)Q1Q04550,,*	FMU (T+1)	DFQ10290
	DFMU	T+1		DFQ10300
	INI	1,4		DFQ10310
	SLJ	COM2	INITIALIZATION FOR COM2	DFQ10320
COM3	SLJ	**	ADDRESS OF CALL TO COM3	DFQ10330
+	LIU	COM3,5	C IN LOWER OF A	DFQ10340
	LDA	-1,5		DFQ10350
	SAL	COM22+1	J (K+1 FOR K=J-1)	DFQ10360
	LIU	T,5	1 TO I4 (J-K FOR K=J-1)	DFQ10370
	ENI	1,4	2J-2 TO I1	DFQ10380
	INI	-1,1		DFQ10390
	SLJ	COM3	REAL TO REAL	DFQ10400
COM4	SLJ	**		DFQ10410
+	LIU	COM4,5		DFQ10420
	LDA	-1,5		DFQ10430
	SAU	COM41		DFQ10440
	LDA	0,5		DFQ10450
	SAL	COM42+3		DFQ10460
COM41	LDA	**	BASE TO T1	DFQ10470
	STA	T+1		DFQ10480
	STA	T+2		DFQ10490
	INI	1,5	EXPONENTIATE	DFQ10500
COM42	BRTJ	(\$)Q2Q07551,,*		DFQ10510
	SLJ	*+2		DFQ10520
	DLDA	T+1	EXPONENT	DFQ10530
	DLDA	**	SET UP EXIT	DFQ10540
	SIU	COM4,5	EXIT	DFQ10550
	SLJ	COM4		DFQ10560
T	BSS	6		DFQ10570
	ENTRY	ZPRINT		DFQ10580

ZPRINT	SLJ	**		DFQ10590
	CODAP			DFQ10600
+	SIU	6	ZEX	DFQ10610
	LIL	6	ZPRINT	DFQ10620
	SIL	6	ZEX	DFQ10630
	INI	6	1	DFQ10640
	LDQ		=077777	DFQ10650
	LDA	6	0	DFQ10660
	STL		T+3	ADDRESS OF OPR
	ARS		24	DFQ10680
	STL		T	ADDRESS OF ZCODE(I)
	LDA	6	1	DFQ10700
	STL		T+1	ADDRESS OF OPL
	ARS		24	DFQ10720
	STL		T+4	ADDRESS OF VR
	LDA	6	2	DFQ10740
	STL		T+5	ADDRESS OF OP
	ARS		24	DFQ10760
	STL		T+2	ADDRESS OF VL
	LDL	7	T	DFQ10780
	ALS		24	DFQ10790
	ENI	6	23	DFQ10800
	LDQ		=07777700000000	DFQ10810
+	MEQ	6	TABOP-1	DFQ10820
	SLJ		FOUND+1	DFQ10830
FOUND	LDQ	6	TABOP-1	DFQ10840
	SLJ		SORT	DFQ10850
	LDQ		=060606060	DFQ10860
SORT	STQ	7	T+5	DFQ10870
	LDA	7	T	DFQ10880
	LRS		15	DFQ10890
	QRS		33	DFQ10900
	STQ	7	T+4	DFQ10910
	LRS		9	DFQ10920
	QRS		39	DFQ10930
	STQ	7	T+3	DFQ10940
	LRS		15	DFQ10950
	QRS		33	DFQ10960
	STQ	7	T+2	DFQ10970
	STA	7	T+1	DFQ10980
ZEX	ENI	6	**	DFQ10990
	SLJ		**	DFQ11000
TABOP	RTJ		Q1Q00550	DFQ11010
-	SSU	2	42131B	DFQ11020
	RTJ		Q1Q01550	DFQ11030
-	SSU	2	12331B	DFQ11040

TABLE OF INT SUBROUTINES
AND THEIR NAMES

-	RTJ		Q1Q04550	DFQ11050
-	MUF	4	46431B	DFQ11060
-	RTJ		Q1Q02550	DFQ11070
-	MUF	2	12431B	DFQ11080
-	RTJ		Q1Q10550	DFQ11090
-	62	6	32131B	DFQ11100
-	RTJ		Q1Q00510	DFQ11110
-	SSU	2	42151B	DFQ11120
-	RTJ		Q1Q01510	DFQ11130
-	SSU	2	12351B	DFQ11140
-	RTJ		Q1Q02510	DFQ11150
-	MUF	2	12451B	DFQ11160
-	RTJ		Q1Q03550	DFQ11170
-	MUF	6	22231B	DFQ11180
-	RTJ		Q1Q03510	DFQ11190
-	MUF	6	22251B	DFQ11200
-	RTJ		Q1Q04510	DFQ11210
-	MUF	4	46451B	DFQ11220
-	RTJ		Q1Q05550	DFQ11230
-	MUF	2	46531B	DFQ11240
-	RTJ		Q1Q05510	DFQ11250
-	MUF	2	46551B	DFQ11260
-	RTJ		Q2Q07551	DFQ11270
-	FSB	6	34651B	DFQ11280
-	RTJ		LOG5	DFQ11290
-	SSU	4	62726B	DFQ11300
-	RTJ		EXP5	DFQ11310
-	DVI	6	74726B	DFQ11320
-	RTJ		SIN5	DFQ11330
-	62	3	14526B	DFQ11340
-	RTJ		COS5	DFQ11350
-	QJP	4	66226B	DFQ11360
-	RTJ		ATAN5	DFQ11370
-	STQ	6	32145B	DFQ11380
-	RTJ		COM1	DFQ11390
-	QJP	4	64401B	DFQ11400
-	RTJ		COM2	DFQ11410
-	QJP	4	64402B	DFQ11420
-	RTJ		COM3	DFQ11430
-	QJP	4	64403B	DFQ11440
-	RTJ		COM4	DFQ11450
-	QJP	4	64404B	DFQ11460
	COMPASS			DFQ11470
	END			DFQ11480
	SUBROUTINE COMPIL(NSYS,MAXNDR)			DFQ11490
	EQUIVALENCE(SYMBOL,KYMBOL)			DFQ11500

	TYPE INTEGER TNAME,DICTION	DFQ11510
	TYPE LOGICAL SW1,SW2	DFQ11520
	COMMON/ERASABLE/MCODE(60),LEX,DICTION(30),KCOMP,LCOMOP(300),	DFQ11530
1	LCOMVAR(300),LIBFUN(10),LOPT(50),LISTOP(50),LVAT(100),LILUB(50),	DFQ11540
2	MTABLE(10),ITABLE(10),KTST	DFQ11550
	COMMON/CONSTANT/CONTAB(50),KCON	DFQ11560
	DATA(MASKHIGH=7777777700000000B),(LSHIF8=10000000B),(MAXCP=300)	DFQ11570
	DATA(ML=7777777B)	DFQ11580
	DATA(LIBFUN=2060606000000000B,4060606000000000B,5460606000000000B,	DFQ11590
1	6160606000000000B,5454606000000000B,4346272600000000B,	DFQ11600
2	2567472600000000B,6231452600000000B,2346622600000000B,	DFQ11610
3	2163214500000000B)	DFQ11620
C	INITIALIZATION	DFQ11630
	KTST=KCOMP=LEX=MTCON=KEQ=0	DFQ11640
	KCON=MAXNDR+1	DFQ11650
	DO 1 N=1,KCON	DFQ11660
1	CONTAB(N)=N-1	DFQ11670
	PRINT 2	DFQ11680
2	FORMAT (23H0 FORMULAS COMPILED ARE //)	DFQ11690
C		DFQ11700
C	READ LEFT SIDE OF FORMULA	DFQ11710
10	CALL RDNUM(NAMEF)	DFQ11720
	NAMEF=NAMEF.AND.MASKHIGH	DFQ11730
	NPAR=NAMEF.AND.7700000000000000B.OR.7R	DFQ11740
	IF(NPAR.EQ.1H)31,40	DFQ11750
C		DFQ11760
C	FORMULA IS PARAMETER DEFINITION	DFQ11770
31	MTCON=MTCON+1	DFQ11780
	MTABLE(MTCON)=NAMEF.OR.4R	DFQ11790
	CALL RDNUM(KYMBOL)	DFQ11800
	IF(KYMBOL.NE.1H=)1003,32	DFQ11810
32	CALL RDNUM(SYMBOL)	DFQ11820
	CALL ADJCON(SYMBOL,ITABLE(MTCON))	DFQ11830
	CALL RDNUM(SYMBOL)	DFQ11840
	IF(KYMBOL.NE.1H\$)1003,10	DFQ11850
40	IF(NPAR.EQ.1H)45,41	DFQ11860
C		DFQ11870
C	SHORTHAND-SYMBOL-VARIABLE-ADD NAME TO LIST	DFQ11880
41	LEX=LEX+1	DFQ11890
	DICTION(LEX)=NAMEF/LSHIF8	DFQ11900
	DICTION(LEX)=DICTION(LEX).AND.ML	DFQ11910
	GO TO 50	DFQ11920
C		DFQ11930
C	D-EQUATION	DFQ11940
45	KEQ=KEQ+1	DFQ11950
50	CALL RDNUM(SYMBOL)	DFQ11960

	IF(KYMBOL.NE.1H=)1003,199	DFQ11970
C		DFQ11980
C	INITIALIZATION FOR COMPILING FUNCTION	DFQ11990
199	KVT=LBANK=SW2=LOPT(1)=LOPT(2)=0	DFQ12000
	LBANK=0	DFQ12010
	KOP=2	DFQ12020
	SW1=1	DFQ12030
	SW4=1.	DFQ12040
	LISTOP(2)=1H+	DFQ12050
	LILUB(2)=1	DFQ12060
C		DFQ12070
C	OBTAIN NEXT SYMBOL	DFQ12080
200	IF(SW4)2002,2001	DFQ12090
2001	SW4=1.	DFQ12100
	KYMBOL=NEXTSYM	DFQ12110
	GO TO 2003	DFQ12120
2002	CALL RDNUM(SYMBOL)	DFQ12130
	CALL RDTYPE(LTYPE)	DFQ12140
2003	IF(LTYPE)220,220,211	DFQ12150
C		DFQ12160
C	OPERATOR	DFQ12170
220	IF(KYMBOL.EQ.1H())221,521	DFQ12180
221	IF(KYMBOL.EQ.1H())222,522	DFQ12190
522	IF(KYMBOL.EQ.1H\$)226,526	DFQ12200
526	IF(KYMBOL.EQ.1H+.OR.KYMBOL.EQ.1H-)227,527	DFQ12210
527	IF(KYMBOL.EQ.1H*.OR.KYMBOL.EQ.1H/)228,528	DFQ12220
528	IF(KYMBOL.EQ.2H**)229,201	DFQ12230
C		DFQ12240
C	VARIABLE	DFQ12250
201	KAR=KYMBOL.AND.700000000B	DFQ12260
	IF(KAR.NE.0)225,2011	DFQ12270
2011	KAR=KYMBOL.AND.770000000000000000B.OR.6060606060606060B	DFQ12280
	IF(KAR.EQ.1HM)2012,202	DFQ12290
2012	CALL SEARCH(2,MTABLE,MTCON,IND,KYMBOL)	DFQ12300
	IF(IND)2014,2013	DFQ12310
2013	CALL ERPAR	DFQ12320
	STOP	DFQ12330
2014	KYMBOL=ITABLE(IND)	DFQ12340
202	KVT=KVT+1	DFQ12350
	LVAT(KVT)=KYMBOL	DFQ12360
	SW2=1	DFQ12370
	GO TO 200	DFQ12380
C		DFQ12390
C	CONSTANT	DFQ12400
211	CALL ADCON(SYMBOL,KYMBOL)	DFQ12410
	GO TO 202	DFQ12420

C		DFQ12430
C	LEFT PAR. (DFQ12440
	221 LBANK=LBANK+5	DFQ12450
	SW2=0	DFQ12460
	GO TO 200	DFQ12470
C		DFQ12480
C	RIGHT PAR.)	DFQ12490
	222 LBANK=LBANK-5	DFQ12500
	IF(LBANK)1003,200,200	DFQ12510
C		DFQ12520
C	END OPERATOR \$	DFQ12530
	226 IF(LBANK.NE.0)1003,223	DFQ12540
	223 SW1=LOPT(KOP-1)	DFQ12550
	LCOP=0	DFQ12560
	GO TO 230	DFQ12570
C		DFQ12580
C	FUNCTION OPERATOR	DFQ12590
	225 LCOP=4+LBANK	DFQ12600
	2251 LUB=1	DFQ12610
	GO TO 230	DFQ12620
C		DFQ12630
C	+ OR - OPERATOR	DFQ12640
	227 LCOP=1+LBANK	DFQ12650
	IF(SW2)2281,2251	DFQ12660
C		DFQ12670
C	* OR / OPERATOR	DFQ12680
	228 LCOP=2+LBANK	DFQ12690
	2281 LUB=0	DFQ12700
	GO TO 230	DFQ12710
C		DFQ12720
C	** OPERATOR	DFQ12730
	229 SW4=0.	DFQ12740
	LCOP=3+LBANK	DFQ12750
	CALL RDNUM(NEXTSYM)	DFQ12760
	CALL RDTYPE(LTYPE)	DFQ12770
	IF (LTYPE) 2292,2292,2282	DFQ12780
	2282 SW5=1.	DFQ12790
	GO TO 2281	DFQ12800
	2292 KAR=NEXTSYM.AND.770000000000000000B .OR. 7R	DFQ12810
	IF (KAR.EQ.1HM) 2282,2293	DFQ12820
	2293 SW5=0.	DFQ12830
	GO TO 230	DFQ12840
C	EXPONENT IS NOT A CONSTANT - CODE A**B AS EXPF(B*LOGF(A))	DFQ12850
	2291 LV2=LVAT(KVT)/LSHIF8	DFQ12860
	LV2=LV2.AND.77777777B	DFQ12870
	KCOMP=KCOMP+1	DFQ12880

	NDEST=TNAME(DUMMY)	DFQ12890
	LCOMOP(KCOMP)=LIBFUN(6).OR.NDEST	DFQ12900
	LCOMVAR(KCOMP)=6060606000000000B.OR.LV2	DFQ12910
	KOP=KOP+1	DFQ12920
	LISTOP(KOP)=LIBFUN(7)	DFQ12930
	LOPT(KOP)=LCOP	DFQ12940
	LILUB(KOP)=1	DFQ12950
	KYMBOL=LIBFUN(3)	DFQ12960
	LUB=0	DFQ12970
	GO TO 250	DFQ12980
C		DFQ12990
C	COMPARE LEVEL OF CURRENT OP WITH THAT OF PRECEEDING	DFQ13000
	230 IF (LCOP .GT. LOPT(KOP)) 240,550	DFQ13010
	240 IF (SW4 .OR. SW5) 250,2291	DFQ13020
C	PROCESS PRECEEDING OP.	DFQ13030
	550 SW1=LCOP.OR.LOPT(KOP-1)	DFQ13040
	IF(SW1)231,551	DFQ13050
	551 NDEST=NAMEF/LSHIF8	DFQ13060
	NDEST=NDEST.AND.77777777B	DFQ13070
	GO TO 232	DFQ13080
	231 NDEST=TNAME(DUMMY)	DFQ13090
	232 LOPDE=LISTOP(KOP).AND.MASKHIGH	DFQ13100
	KCOMP=KCOMP+1	DFQ13110
	IF(KCOMP.GT.MAXCP)1005,552	DFQ13120
	552 LCOMOP(KCOMP)=LOPDE.OR.NDEST	DFQ13130
	LV2=LVAT(KVT)/LSHIF8	DFQ13140
	LV2=LV2.AND.77777777B	DFQ13150
	IF(LILUB(KOP))233,553	DFQ13160
C		DFQ13170
C	BINARY OPERATION	DFQ13180
	553 KVT=KVT-1	DFQ13190
	LV1=LVAT(KVT).AND.MASKHIGH	DFQ13200
	GO TO 234	DFQ13210
C		DFQ13220
C	UNITARY OPERATION	DFQ13230
C		DFQ13240
	233 LV1=6060606000000000B	DFQ13250
	234 LCOMVAR(KCOMP)=LV1.OR.LV2	DFQ13260
	LVAT(KVT)=NDEST*LSHIF8	DFQ13270
	KOP=KOP-1	DFQ13280
	IF (SW1) 230,260	DFQ13290
C		DFQ13300
C	ADD CURRENT OP TO OP TABLE	DFQ13310
	250 KOP=KOP+1	DFQ13320
	LISTOP(KOP)=KYMBOL	DFQ13330
	LOPT(KOP)=LCOP	DFQ13340

	LILUB(KOP)=LUB	DFQ13350
	GO TO 200	DFQ13360
260	IF((LEX.GT.30).OR.(MTCN.GT.10))261,262	DFQ13370
261	CALL ERLEX	DFQ13380
	STOP	DFQ13390
262	IF(KEQ.EQ.NSYS)263,10	DFQ13400
263	RETURN	DFQ13410
C		DFQ13420
C	ERROR RETURNS	DFQ13430
1003	PRINT 1021,NAMEF	DFQ13440
1021	FORMAT(36H PARENTHESIS ERROR IN DEFINITION OF A4//)	DFQ13450
	RETURN	DFQ13460
1005	CALL ERCOM	DFQ13470
	STOP	DFQ13480
	END	DFQ13490
	FUNCTION TNAME(DUMMY)	DFQ13500
	TYPE INTEGER TNAME	DFQ13510
	COMMON/ERASABLE/FIRST(972),K	DFQ13520
	K=K+1	DFQ13530
	IF(K.GT.100)1,2	DFQ13540
1	CALL ERTST	DFQ13550
	STOP	DFQ13560
2	TNAME=64*K+63B	DFQ13570
	RETURN	DFQ13580
	END	DFQ13590
	FUNCTION NAD(NAME,Y,D,Q,T,KS)	DFQ13600
	DIMENSION Y(1),D(1),Q(1),T(1)	DFQ13610
	COMMON/ERASABLE/MC(60),LEX,DICTION(30),MORE(881),KTST	DFQ13620
	COMMON/CONSTANT/C(50),NC	DFQ13630
	LB1=NAME.AND.77B	DFQ13640
	LBT=NAME/100B	DFQ13650
	LB2=LBT.AND.77B	DFQ13660
	LB3=LBT/100B	DFQ13670
	LB4=NAME/1000000B	DFQ13680
	LB3=LB3.AND.77B	DFQ13690
	LB4=LB4.AND.77B	DFQ13700
	IF(LB1.EQ.1RC)10,1	DFQ13710
1	IF(LB1.EQ.1RT)20,2	DFQ13720
2	IF(LB4.EQ.1RY)30,3	DFQ13730
3	IF(LB4.EQ.1RD)40,50	DFQ13740
C		DFQ13750
C	CONSTANT	DFQ13760
10	NAD=KRAMDN(0,C(LBT))	DFQ13770
	RETURN	DFQ13780
C		DFQ13790
C	INTERMEDIATE STORAGE	DFQ13800

20	K=KS*(LBT-1)+1	DFQ13810
	NAD=KRAMDN(0,T(K))	DFQ13820
	RETURN	DFQ13830
C		DFQ13840
C	Y	DFQ13850
30	K=KRAMDN(0,Y(0))	DFQ13860
	GO TO 41	DFQ13870
C		DFQ13880
C	D	DFQ13890
40	K=KRAMDN(0,D(0))	DFQ13900
41	IF(LB2.EQ.60B)42,43	DFQ13910
42	NAD=K+(LB3-1)*KS+1	DFQ13920
	RETURN	DFQ13930
43	NAD=K+(LB3*10+LB2-1)*KS+1	DFQ13940
	RETURN	DFQ13950
C		DFQ13960
C	SHORTHAND-SYMBOL VARIABLE	DFQ13970
50	CALL SEARCH(2,DICTION,LEX,IND,NAME)	DFQ13980
	K=KS*(IND-1)+1	DFQ13990
	NAD=KRAMDN(0,Q(K))	DFQ14000
	END	DFQ14010
	SUBROUTINE ERRORS	DFQ14020
	DIMENSION IFMT(5)	DFQ14030
	DATA(IFMT=8H(35HOLEN,8HGTH OF ,0,8HTABLE EX,8HCEEDED.))	DFQ14040
	ENTRY ERCON	DFQ14050
	IFMT(3)=8HCONST.	DFQ14060
10	PRINT IFMT	DFQ14070
	STOP	DFQ14080
	ENTRY ERLEX	DFQ14090
	IFMT(3)=8HLEXICON	DFQ14100
	GO TO 10	DFQ14110
	ENTRY ERDIF	DFQ14120
	PRINT 11	DFQ14130
11	FORMAT(26HOUNDIFFERENTIABLE OP-CODE.)	DFQ14140
	STOP	DFQ14150
	ENTRY ERTST	DFQ14160
	IFMT(3)=8HT-STORE	DFQ14170
	GO TO 10	DFQ14180
	ENTRY ERCOM	DFQ14190
	IFMT(3)=8HCOMPILE	DFQ14200
	GO TO 10	DFQ14210
	ENTRY ERYCD	DFQ14220
	IFMT(3)=8HY-CODE	DFQ14230
	GO TO 10	DFQ14240
	ENTRY ERZCD	DFQ14250
	IFMT(3)=8HZ-CODE	DFQ14260

GO TO 10	DFQ14270
ENTRY ERPAR	DFQ14280
PRINT 12	DFQ14290
12 FORMAT(22H0 UNDEFINED PARAMETER.)	DFQ14300
STOP	DFQ14310
END	DFQ14320
SUBROUTINE ADCON(CN,NCON)	DFQ14330
COMMON/CONSTANT/C(50),KC	DFQ14340
CALL SEARCH(2,C,KC,IND,CN)	DFQ14350
IF(IND)5,1	DFQ14360
1 KC=KC+1	DFQ14370
IF(KC.GT.50)2,3	DFQ14380
2 CALL ERCON	DFQ14390
STOP	DFQ14400
3 C(KC)=CN	DFQ14410
IND=KC	DFQ14420
5 NCON=(IND*64+23B)*100000000B	DFQ14430
RETURN	DFQ14440
END	DFQ14450
	DFQ14460
ALLEN REITER'S SUBROUTINE SEARCH HAS BEEN REPLACED	DFQ14470
BY THE LIBRARY SUBROUTINE OF THE SAME NAME	DFQ14480
	DFQ14490
SUBROUTINE RDNUM(ISIT)	DFQ14500
TYPE INTEGER STAGE,COLCOUNT,COLMAX,CHARAC,CHARTYPE,OLDCHAR,	DFQ14510
1 RDBYTE,WORD,TESDC,EXPONENT,DIGITS,ESIGN,SIGN	DFQ14520
DIMENSION BUFFER(10),TYPETAB(4),DECISION(12),XPA(4),XPB(10),	DFQ14530
1 XPC(10)	DFQ14540
DATA(COLCOUNT=74),(COLMAX=73),(PRINTING=1.0),(MASK=77B),	DFQ14550
1 (TYPETAB=111111111073000B,3555545555027007B,3555555555077000B,	DFQ14560
1 6755555555077000B),(DECISION=8H532==1=/,8H54TTTTT/,8H6TTTTTT/,	DFQ14570
18H6/////////,8H56V7VVV/,8H6VV7VVV/,8H9V8//7//,8H9V///8//,8H9VVVVVVV/,	DFQ14580
1 8H=XX=X=/,8HXXX=X=/,8H=XX=X=/),(XPA=1.0,1.0E100,1.0E200,	DFQ14590
1 1.0E300),(XPB=1.0,1.0E10,1.0E20,1.0E30,1.0E40,1.0E50,1.0E60,	DFQ14600
1 1.0E70,1.0E80,1.0E90),(XPC=1.0,10.0,100.0,1000.0,10000.0,1.0E5,	DFQ14610
1 1.0E6,1.0E7,1.0E8,1.0E9)	DFQ14620
EQUIVALENCE(X,I)	DFQ14630
FLOATING=1.0	DFQ14640
GO TO 1	DFQ14650
ENTRY RDINT	DFQ14660
FLOATING=0.0	DFQ14670
1 STAGE=1	DFQ14680
N=DIGITS=EXPONENT=WORD=TESDC=SIGN=ESIGN=0	DFQ14690
11 OLDCHAR=CHARAC	DFQ14700
IF(COLCOUNT-COLMAX)3,6,2	DFQ14710
6 CHARAC=1R	DFQ14720

	GO TO 7	DFQ14730
	2 READ 500,(BUFFER(I),I=1,10)	DFQ14740
500	FORMAT(10A8)	DFQ14750
	IF(PRINTING)4,5	DFQ14760
	4 PRINT 501,(BUFFER(I),I=1,10)	DFQ14770
501	FORMAT(X9A8,XA8)	DFQ14780
	5 COLCOUNT=1	DFQ14790
	3 CHARAC=RDBYTE(BUFFER,COLCOUNT,8,64,MASK)	DFQ14800
	7 COLCOUNT=COLCOUNT+1	DFQ14810
	CHARTYPE=RDBYTE(TYPETAB,CHARAC+1,16,8,7)	DFQ14820
	IF(CHARTYPE)130,131	DFQ14830
131	CHARTYPE=8	DFQ14840
130	STAGE=RDBYTE(DECISION(STAGE),CHARTYPE,8,64,MASK)	DFQ14850
	IF(STAGE-11)10,9,100	DFQ14860
	9 STAGE=10	DFQ14870
	10 GO TO (11,12,11,11,15,16,11,18,19,20),STAGE	DFQ14880
	12 IF(CHARAC-1R+)21,11	DFQ14890
	21 SIGN=1	DFQ14900
	GO TO 11	DFQ14910
	15 IF OVERFLOW FAULT 22,22	DFQ14920
	22 IF(CHARAC-10)24,25,25	DFQ14930
	24 I=N+N	DFQ14940
	I=I+I+N	DFQ14950
	I=I+I+CHARAC	DFQ14960
	IF OVERFLOW FAULT 25,26	DFQ14970
	26 N=I	DFQ14980
	GO TO 11	DFQ14990
	25 DIGITS=DIGITS+1	DFQ15000
	GO TO 11	DFQ15010
	16 DIGITS=DIGITS-1	DFQ15020
	GO TO 15	DFQ15030
	18 IF((CHARAC-1R+)*(CHARAC-1R))27,11	DFQ15040
	27 ESIGN=1	DFQ15050
	GO TO 11	DFQ15060
	19 EXPONENT=EXPONENT*10+CHARAC	DFQ15070
	GO TO 11	DFQ15080
	20 I=WORD.AND.770000000000000000B	DFQ15090
	IF(I)11,28	DFQ15100
	28 WORD=64*WORD	DFQ15110
	WORD=WORD.OR.CHARAC	DFQ15120
	GO TO 11	DFQ15130
C	SCAN COMPLETE. PREPARE FOR EXIT	DFQ15140
100	STAGE=STAGE+1-1R/	DFQ15150
	GO TO (101,102,103,104,105,106,107),STAGE	DFQ15160
101	I=COLCOUNT-1	DFQ15170
	PRINT 502,I,CHARAC	DFQ15180

GO TO 1	DFQ15190
502 FORMAT(19H INPUT ERROR COLUMN 13,11H CHARACTER 02)	DFQ15200
103 COLCOUNT=COLCOUNT-1	DFQ15210
CHARAC=OLDCHAR	DFQ15220
102 ISIT=CHARAC*1000000000000000B	DFQ15230
ISIT=7R .OR. ISIT	DFQ15240
114 RETURN	DFQ15250
105 COLCOUNT=COLCOUNT-1	DFQ15260
104 DIGITS=DIGITS+(1-ESIGN-ESIGN)*EXPONENT	DFQ15270
TESDC=1	DFQ15280
N=N*(1-SIGN-SIGN)	DFQ15290
108 IF(FLOATING)124,109	DFQ15300
109 ISIT=N	DFQ15310
IF(DIGITS)126,114,111	DFQ15320
111 IFOVERFLOW FAULT 112,112	DFQ15330
112 DO 120 I=1,DIGITS	DFQ15340
N=ISIT+ISIT	DFQ15350
N=N+N+ISIT	DFQ15360
120 ISIT=N+N	DFQ15370
IF OVERFLOW FAULT 113,114	DFQ15380
113 PRINT 503	DFQ15390
503 FORMAT(18H INTEGER TOO LARGE)	DFQ15400
ISIT=3777777777777777B	DFQ15410
GO TO 114	DFQ15420
126 DIGITS=-DIGITS	DFQ15430
DO 125 I=1,DIGITS	DFQ15440
125 ISIT=ISIT/10	DFQ15450
GO TO 114	DFQ15460
124 X=N	DFQ15470
K=XABSF(DIGITS)	DFQ15480
J1=K/100	DFQ15490
K=K-100*J1	DFQ15500
J2=K/10	DFQ15510
K=K-J2*10	DFQ15520
Y=XPA(J1+1)*XPB(J2+1)*XPC(K+1)	DFQ15530
IF(DIGITS)115,116,117	DFQ15540
115 X=X/Y	DFQ15550
116 ISIT=I	DFQ15560
GO TO 114	DFQ15570
117 X=X*Y	DFQ15580
GO TO 116	DFQ15590
107 COLCOUNT=COLCOUNT-1	DFQ15600
106 TESDC=-1	DFQ15610
ISIT=WORD	DFQ15620
I=WORD.AND.7700000000000000B	DFQ15630
IF(I)114,132	DFQ15640

132	WORD=WORD*64			DFQ15650
	WORD=WORD.OR.1R			DFQ15660
	GO TO 106			DFQ15670
	ENTRY RDTYPE			DFQ15680
	ISIT=TESDC			DFQ15690
	GO TO 114			DFQ15700
	ENTRY RDPRINT			DFQ15710
	PRINTING=ISIT			DFQ15720
	GO TO 114			DFQ15730
	ENTRY RDMODE			DFQ15740
	GO TO (201,202),ISIT			DFQ15750
201	DECISION(10)=DECISION(11)			DFQ15760
	GO TO 114			DFQ15770
202	DECISION(10)=DECISION(12)			DFQ15780
	GO TO 114			DFQ15790
	END			DFQ15800
	FUNCTION RDBYTE(I,J,K,KK,MASK)			DFQ15810
	DIMENSION I(10)			DFQ15820
	N=(J-1)/K			DFQ15830
	M=K+K*N-J			DFQ15840
	II=I(N+1)			DFQ15850
	IF(M)1,1,2			DFQ15860
2	NN=1			DFQ15870
	DO 3 N=1,M			DFQ15880
3	NN=NN*KK			DFQ15890
	II=II/NN			DFQ15900
1	RDBYTE=II.AND.MASK			DFQ15910
	END			DFQ15920
	IDENT		KRAM	DFQ15930
	CODAP			DFQ15940
	ENTRY		KRAMDN	DFQ15950
<KRAMDN	SLJ		**	DFQ15960
+	SIU	6	EXIT	DFQ15970
	LIL	6	KRAMDN	DFQ15980
	SIL	6	EXIT	DFQ15990
	INI	6	1	DFQ16000
	LDA	6	0	DFQ16010
	STA		=SSAV	DFQ16020
	LIU	6	SAV	DFQ16030
	SCL		=0-77777	DFQ16040
	ADD	6	0	DFQ16050
EXIT	ENI	6	**	DFQ16060
	SLJ		**	DFQ16070
	ENTRY		KRAMUP	DFQ16080
KRAMUP	SLJ		**	DFQ16090
+	SIU	6	EXIT	DFQ16100

	LIL	6	KRAMUP		DFQ16110
	SIL	6	EXIT		DFQ16120
	INI	6	1		DFQ16130
	LDA	6	0		DFQ16140
	STA		SAV		DFQ16150
	LIU	6	SAV		DFQ16160
	SCL		=0-77777		DFQ16170
	ALS		24		DFQ16180
	ADD	6	0		DFQ16190
	SLJ		EXIT		DFQ16200
	COMPASS				DFQ16210
	END				DFQ16220
	IDENT		INTERVAL	INTERVAL ARITHMETIC PACKAGE	DFQ16230
	EXT		LOG5		DFQ16240
	EXT		EXP5		DFQ16250
	EXT		SPOPSADD		DFQ16260
	EXT		SPOPSMUL		DFQ16270
	EXT		SPOPSDIV		DFQ16280
	EXT		ERRORINT		DFQ16290
DICT.	OCT		0		DFQ16300
	BCD		1,INTERVAL		DFQ16310
A	OCT		0		DFQ16320
	OCT		0		DFQ16330
B	OCT		0		DFQ16340
	OCT		0		DFQ16350
TEMP	BSS		4		DFQ16360
	ENTRY		Q1Q00530		DFQ16370
Q1Q00530	BSS		0		DFQ16380
	ENTRY		Q1Q00550	LOAD ACC WITH INTERVAL	DFQ16390
Q1Q00550	SLJ		**		DFQ16400
+	RTJ		IN1		DFQ16410
+	LDA		A,7		DFQ16420
	STA		=SEL		DFQ16430
	LDA		A+1,7		DFQ16440
Q005	STA		=SER		DFQ16450
	SLJ		EXIT		DFQ16460
	ENTRY		Q1Q01530		DFQ16470
Q1Q01530	BSS		0		DFQ16480
	ENTRY		Q1Q01550	LOAD NEGATIVE WITH INTERVAL	DFQ16490
Q1Q01550	SLJ		**		DFQ16500
+	RTJ		IN1		DFQ16510
+	LAC		A+1,7		DFQ16520
	STA		EL		DFQ16530
	LAC		A,7		DFQ16540
	SLJ		Q005		DFQ16550
	ENTRY		Q1Q00500	LDA WITH INTEGER	DFQ16560

Q1Q00500	SLJ	**		DFQ16570
+	RTJ	IN1		DFQ16580
+	LDA	A,7		DFQ16590
Q054	RTJ	FLOAT		DFQ16600
Q05	STA	=SEL		DFQ16610
	SLJ	Q005		DFQ16620
	ENTRY	Q1Q01500	LAC WTH INTEGER	DFQ16630
Q1Q01500	SLJ	**		DFQ16640
+	RTJ	IN1		DFQ16650
+	LAC	A,7		DFQ16660
	SLJ	Q054		DFQ16670
	ENTRY	Q1Q00510	LDA WITH REAL	DFQ16680
Q1Q00510	SLJ	**		DFQ16690
+	RTJ	IN1		DFQ16700
+	LDA	A,7		DFQ16710
	SLJ	Q05		DFQ16720
	ENTRY	Q1Q01510	LAC WITH REAL	DFQ16730
Q1Q01510	SLJ	**		DFQ16740
+	RTJ	IN1		DFQ16750
+	LAC	A,7		DFQ16760
	SLJ	Q05		DFQ16770
	ENTRY	Q1Q02500	ADD INTEGER	DFQ16780
Q1Q02500	SLJ	**		DFQ16790
+	RTJ	IN1		DFQ16800
+	LDA	A,7		DFQ16810
ADINT	RTJ	FLOAT		DFQ16820
ADREAL	STA	=SSAVA		DFQ16830
+	LDQ	EL		DFQ16840
	RTJ	SPOPSADD		DFQ16850
	STQ	EL		DFQ16860
	LDA	SAVA		DFQ16870
+	LDQ	ER		DFQ16880
	RTJ	SPOPSADD		DFQ16890
	SLJ	Q005		DFQ16900
	ENTRY	Q1Q03500	SUBTRACT INTEGER	DFQ16910
Q1Q03500	SLJ	**		DFQ16920
+	RTJ	IN1		DFQ16930
+	LAC	A,7		DFQ16940
	SLJ	ADINT		DFQ16950
	ENTRY	Q1Q02510	ADD REAL	DFQ16960
Q1Q02510	SLJ	**		DFQ16970
+	RTJ	IN1		DFQ16980
+	LDA	A,7		DFQ16990
	SLJ	ADREAL		DFQ17000
	ENTRY	Q1Q03510	SUBTRACT REAL	DFQ17010
Q1Q03510	SLJ	**		DFQ17020

	+	RTJ	IN1		DFQ17030
	+	LAC	A,7		DFQ17040
		SLJ	ADREAL		DFQ17050
		ENTRY	Q1Q02530		DFQ17060
	Q1Q02530	BSS	0		DFQ17070
		ENTRY	Q1Q02550	ADD INTERVAL	DFQ17080
	Q1Q02550	SLJ	**		DFQ17090
	+	RTJ	IN1		DFQ17100
	AD55	LDA	A,7		DFQ17110
	+	LDQ	EL		DFQ17120
		RTJ	SPOPSADD		DFQ17130
		STQ	EL		DFQ17140
		LDA	A+1,7		DFQ17150
	AD5	LDQ	ER		DFQ17160
		RTJ	SPOPSADD		DFQ17170
		SLJ	Q005		DFQ17180
		ENTRY	Q1Q03530		DFQ17190
	Q1Q03530	BSS	0		DFQ17200
		ENTRY	Q1Q03550	SUBTRACT INTERVAL	DFQ17210
	Q1Q03550	SLJ	**		DFQ17220
	+	RTJ	IN1		DFQ17230
	SUB55	LAC	A+1,7		DFQ17240
	+	LDQ	EL		DFQ17250
		RTJ	SPOPSADD		DFQ17260
		STQ	EL		DFQ17270
		LAC	A,7		DFQ17280
		SLJ	AD5		DFQ17290
		ENTRY	Q1Q04500		DFQ17300
	Q1Q04500	SLJ	**		DFQ17310
	+	RTJ	IN1		DFQ17320
	+	LDA	A,7		DFQ17330
		RTJ	FLOAT		DFQ17340
	Q0315	STA	=SDL		DFQ17350
		STA	=SDR		DFQ17360
	MULT	LDA	DL		DFQ17370
	+	LDQ	EL		DFQ17380
		RTJ	SPOPSMUL		DFQ17390
		STA	=STMAX		DFQ17400
		STQ	=STMIN		DFQ17410
		LDA	DL		DFQ17420
	+	LDQ	ER		DFQ17430
		RTJ	SPOPSMUL		DFQ17440
		RTJ	MAXMIN		DFQ17450
	+	LDA	DR		DFQ17460
	+	LDQ	EL		DFQ17470
		RTJ	SPOPSMUL		DFQ17480

	RTJ	MAXMIN		DFQ17490
+	LDA	DR		DFQ17500
+	LDQ	ER		DFQ17510
	RTJ	SPOPSMUL		DFQ17520
	RTJ	MAXMIN		DFQ17530
+	LDA	TMIN		DFQ17540
	STA	EL		DFQ17550
	LDA	TMAX		DFQ17560
	SLJ	Q005		DFQ17570
	ENTRY	Q1Q04510	MULTIPLY BY REAL	DFQ17580
Q1Q04510	SLJ	**		DFQ17590
+	RTJ	IN1		DFQ17600
+	LDA	A,7		DFQ17610
	SLJ	Q0315		DFQ17620
	ENTRY	Q1Q04530		DFQ17630
Q1Q04530	BSS	0		DFQ17640
	ENTRY	Q1Q04550	MULTIPLY BY INTERVAL	DFQ17650
Q1Q04550	SLJ	**		DFQ17660
+	RTJ	IN1		DFQ17670
Q0455	LDA	A,7		DFQ17680
	STA	=SDL		DFQ17690
	LDA	A+1,7		DFQ17700
	STA	=SDR		DFQ17710
	SLJ	MULT		DFQ17720
	ENTRY	Q1Q05530		DFQ17730
Q1Q05530	BSS	0		DFQ17740
	ENTRY	Q1Q05550	DIVIDE BY INTERVAL	DFQ17750
Q1Q05550	SLJ	**		DFQ17760
+	RTJ	IN1		DFQ17770
Q555	LDA	A,7	TEST FOR DIVISION BY ZERO	DFQ17780
	AJP,ZR	ERRDIV		DFQ17790
	AJP,PL	Q5551		DFQ17800
	LDA	A+1,7		DFQ17810
	AJP,ZR	ERRDIV		DFQ17820
	AJP,PL	ERRDIV		DFQ17830
Q5551	LDA	F1		DFQ17840
+	LDQ	A+1,7		DFQ17850
	RTJ	SPOPSDIV		DFQ17860
	STQ	DL		DFQ17870
	LDA	F1		DFQ17880
+	LDQ	A,7		DFQ17890
	RTJ	SPOPSDIV		DFQ17900
	STA	DR		DFQ17910
	SLJ	MULT		DFQ17920
	ENTRY	Q1Q05500	DIVIDE BY INTEGER	DFQ17930
Q1Q05500	SLJ	**		DFQ17940

	+	RTJ	IN1		DFQ17950
	+	LDA	A,7		DFQ17960
		RTJ	FLOAT		DFQ17970
Q055		STA	DL		DFQ17980
		AJP,ZR	ERRDIV		DFQ17990
		LDA	F1		DFQ18000
	+	LDQ	DL		DFQ18010
		RTJ	SPOPSDIV		DFQ18020
		STQ	DL		DFQ18030
		STA	DR		DFQ18040
		SLJ	MULT		DFQ18050
		ENTRY	Q1Q05510	DIVIDE BY REAL	DFQ18060
Q1Q05510		SLJ	**		DFQ18070
	+	RTJ	IN1		DFQ18080
	+	LDA	A,7		DFQ18090
		SLJ	Q055		DFQ18100
ERRDIV		BRTJ	(\$)ERRORINT,,*		DFQ18110
	+	SLJ	EXIT		DFQ18120
		ENTRY	Q1Q10050	STORE INTEGER	DFQ18130
Q1Q10050		SLJ	**		DFQ18140
	+	RTJ	IN1		DFQ18150
	+	RTJ	FLOAT		DFQ18160
Q100		STA	A,7		DFQ18170
		STA	A+1,7		DFQ18180
		STA	=SEL		DFQ18190
		STA	=SER		DFQ18200
		SLJ	EXIT		DFQ18210
		ENTRY	Q1Q10150	STORE REAL	DFQ18220
Q1Q10150		SLJ	**		DFQ18230
	+	RTJ	IN1		DFQ18240
	+	SLJ	Q100		DFQ18250
		ENTRY	Q1Q10550	STORE INTERVAL	DFQ18260
Q1Q10550		SLJ	**		DFQ18270
	+	RTJ	IN1		DFQ18280
	+	LDA	EL		DFQ18290
		STA	A,7		DFQ18300
		LDQ	ER		DFQ18310
		STQ	A+1,7		DFQ18320
		SLJ	EXIT		DFQ18330
		ENTRY	Q1Q10510	STORE INTERVAL IN REAL	DFQ18340
Q1Q10510		SLJ	**	-----TAKES AVERAGE	DFQ18350
	+	RTJ	IN1		DFQ18360
	+	LDA	EL		DFQ18370
		FAD	ER		DFQ18380
		FDV	=020024000000000000		DFQ18390
		STA	A,7		DFQ18400

	SLJ	EXIT		DFQ18410
	ENTRY	Q1Q10500	STORE INTERVAL IN INTEGER	DFQ18420
Q1Q10500	SLJ	**	----- TAKES AVERAGE	DFQ18430
+	RTJ	IN1		DFQ18440
+	LDA	EL		DFQ18450
	FAD	ER		DFQ18460
	FDV	=020024000000000000		DFQ18470
	RTJ	FIX		DFQ18480
+	STA	A,7		DFQ18490
	SLJ	EXIT		DFQ18500
	ENTRY	Q0Q06500	COMPLEMENT ACC	DFQ18510
Q0Q06500	SLJ	**		DFQ18520
+	LAC	EL		DFQ18530
	LQC	ER		DFQ18540
	STQ	EL		DFQ18550
	STA	ER		DFQ18560
	SLJ	Q0Q06500		DFQ18570
	ENTRY	Q2Q07055,Q2Q07155,Q2Q07555	INTERVAL EXPONENT - TREAT	DFQ18580
Q2Q07055	BSS	0	SET OF POWERS	DFQ18590
Q2Q07155	BSS	0		DFQ18600
Q2Q07555	SLJ	**		DFQ18610
+	RTJ	IN2		DFQ18620
+	LDA	A+1,7		DFQ18630
	STA	TEMP+3		DFQ18640
Q071	LDA	A,7		DFQ18650
	STA	TEMP+2	EXPONENT TO TEMP+2	DFQ18660
	LDA	B,7		DFQ18670
	AJP,ZR	ERREXP	NEGATIVE BASE	DFQ18680
	AJP,MI	ERREXP		DFQ18690
	STA	TEMP		DFQ18700
	LDA	B+1,7		DFQ18710
	STA	TEMP+1		DFQ18720
Q072	BRTJ	(\$)LOG5,,*		DFQ18730
	SLJ	*+2		DFQ18740
	01	DICT.		DFQ18750
	00	(\$)TEMP		DFQ18760
+	BRTJ	(\$)Q1Q04550,,*	FMU(TEMP)	DFQ18770
	DLDA	TEMP+2	TEMP*EXPONENT TO ACC	DFQ18780
+	BRTJ	(\$)Q1Q10550,,*		DFQ18790
	DSTA	TEMP	TEMP=EXPONENT * LOG(BASE)	DFQ18800
	BRTJ	(\$)EXP5,,*		DFQ18810
	SLJ	*+2		DFQ18820
	01	DICT.		DFQ18830
+	00	(\$)TEMP		DFQ18840
+	SLJ	EX2		DFQ18850
ERREXP	BRTJ	(\$)ERRORINT,,*		DFQ18860

	+	SLJ	EX2		DFQ18870
		ENTRY	Q2Q07115,Q2Q07515,Q2Q07015		DFQ18880
	Q2Q07015	BSS	0		DFQ18890
	Q2Q07115	BSS	0		DFQ18900
	Q2Q07515	SLJ	**	REAL TO INTERVAL POWER	DFQ18910
	+	RTJ	IN2		DFQ18920
	+	LDA	B,7		DFQ18930
	RTIP	AJP,ZR	ERREXP		DFQ18940
		AJP,MI	ERREXP		DFQ18950
		STA	TEMP		DFQ18960
		STA	TEMP+1		DFQ18970
		LDQ	A,7		DFQ18980
		STQ	TEMP+2		DFQ18990
		LDQ	A+1,7		DFQ19000
		STQ	TEMP+3		DFQ19010
		SLJ	Q072		DFQ19020
		ENTRY	Q2Q07005,Q2Q07105,Q2Q07505		DFQ19030
	Q2Q07005	BSS	0		DFQ19040
	Q2Q07105	BSS	0		DFQ19050
	Q2Q07505	SLJ	**	INTEGER TO INTERVAL POWER	DFQ19060
	+	RTJ	IN2		DFQ19070
	+	LDA	B,7		DFQ19080
		RTJ	FLOAT		DFQ19090
		SLJ	RTIP		DFQ19100
		ENTRY	Q2Q07050,Q2Q07150,Q2Q07550	INTEGER EXPONENTS	DFQ19110
	Q2Q07050	BSS	0	-TREATED AS INTERVAL PRODUCTS	DFQ19120
	Q2Q07150	BSS	0	TAKEN N TIMES	DFQ19130
	Q2Q07550	SLJ	**		DFQ19140
	+	RTJ	IN2		DFQ19150
	+	LDA	A,7	J=EXPONENT	DFQ19160
		RTJ	TESTEXP		DFQ19170
	REMULTI	LDQ	B,7		DFQ19180
		STQ	TEMP		DFQ19190
		LDQ	B+1,7		DFQ19200
		STQ	TEMP+1	Y=BASE	DFQ19210
		LDQ	F1		DFQ19220
		STQ	TEMP+2		DFQ19230
		STQ	TEMP+3	P=1	DFQ19240
	LOOP	ENQ	0		DFQ19250
		LRS	1		DFQ19260
		STA	=SJ	J=J/2	DFQ19270
		QJP,ZR	PASS	SKIP IF LOW-ORDER BIT=0	DFQ19280
		BRTJ	(\$)Q1Q00550,,*		DFQ19290
		DLDA	TEMP	LDA (TEMP)	DFQ19300
		BRTJ	(\$)Q1Q04550,,*		DFQ19310
		DLDA	TEMP+2	FMU(TEMP+2)	DFQ19320

	BRTJ	(\$)Q1Q10550,,*	STA(TEMP+2)	DFQ19330
	DSTA	TEMP+2	P=P*Y	DFQ19340
PASS	BRTJ	(\$)Q1Q00550,,*	LDA(TEMP)	DFQ19350
	DLDA	TEMP		DFQ19360
	BRTJ	(\$)Q1Q04550,,*	FMU(TEMP)	DFQ19370
	DLDA	TEMP		DFQ19380
	BRTJ	(\$)Q1Q10550,,*	STA(TEMP)	DFQ19390
	DSTA	TEMP	Y=Y*Y	DFQ19400
	LDA	J		DFQ19410
	AJP,NZ	LOOP	END IF J=0	DFQ19420
ENDEXP	LDQ	SEXP		DFQ19430
	QJP,PL	EXPOS		DFQ19440
	BRTJ	(\$)Q1Q00510,,*		DFQ19450
	DLDA	F1	LDA 1.	DFQ19460
	BRTJ	(\$)Q1Q05550,,*		DFQ19470
	DLDA	TEMP+2	FDV B	DFQ19480
EXPOS	SLJ	EX2		DFQ19490
	BRTJ	(\$)Q1Q00550,,*	LDA B	DFQ19500
	DLDA	TEMP+2		DFQ19510
	SLJ	EX2	EXIT	DFQ19520
TESTEXP	SLJ	**	CHECK FOR NEGATIVE EXPONENT	DFQ19530
	AJP,PL	POSEXP		DFQ19540
	ENQ	-1	-1 FOR NEGATIVE EXPONENT	DFQ19550
	SCM	ALSEV	COMPLEMENT A	DFQ19560
	STQ	=SSEXP		DFQ19570
	SLJ	TESTEXP		DFQ19580
POSEXP	ENQ	1	+1 FOR POSITIVE EXPONENT	DFQ19590
	SLJ	*-1		DFQ19600
	ENTRY	Q2Q07553		DFQ19610
Q2Q07553	BSS	0		DFQ19620
	ENTRY	Q2Q07051,Q2Q07151,Q2Q07551	REAL EXPONENT - SET OF	DFQ19630
Q2Q07051	BSS	0		DFQ19640
Q2Q07151	BSS	0		DFQ19650
Q2Q07551	SLJ	**		DFQ19660
	RTJ	IN2		DFQ19670
+	LDA	A,7		DFQ19680
	RTJ	FIX	FIX EXPONENT	DFQ19690
+	STA	=SK1	TEST FOR INTEGER	DFQ19700
	RTJ	FLOAT		DFQ19710
+	FSB	A,7		DFQ19720
	AJP,ZR	WHOLE	EXACT INTEGER IF A=0	DFQ19730
	LDA	A,7		DFQ19740
	STA	TEMP+3		DFQ19750
	SLJ	Q071		DFQ19760
WHOLE	LDA	K1		DFQ19770
	RTJ	TESTEXP		DFQ19780

	LDQ	B,7		DFQ19790
	QJP,PL	REMULTI	IF B DOES NOT CONTAIN ZERO,	DFQ19800
	LDQ	B+1,7	ALGORITHM IS SAME AS INTEGER EXP	DFQ19810
	QJP,MI	REMULTI		DFQ19820
	STA	K1		DFQ19830
	ENQ	1		DFQ19840
	LDL	K1	TEST FOR EVEN OR ODD	DFQ19850
	AJP,ZR	EVEN		DFQ19860
	LDA	K1		DFQ19870
	LDQ	B,7	ODD EXPONENT	DFQ19880
	RTJ	REPEAT1	OBTAIN LEFT END-POINT BY	DFQ19890
+	STQ	TEMP+1	REPEATED MULTIPLICATIONS	DFQ19900
	SLJ	REPEAT2		DFQ19910
+	LDQ	TEMP+1	LOWER RESULT	DFQ19920
	STQ	TEMP+2		DFQ19930
	LDQ	B+1,7		DFQ19940
UPPER	LDA	K1	OBTAIN RIGHT ENDPOINT	DFQ19950
	RTJ	REPEAT1		DFQ19960
+	STA	TEMP+1	UPPER RESULT	DFQ19970
	SLJ	REPEAT2		DFQ19980
+	LDQ	TEMP+1		DFQ19990
	STQ	TEMP+3		DFQ20000
	SLJ	ENDEXP		DFQ20010
EVEN	ENQ	0	EVEN EXPONENT	DFQ20020
	STQ	TEMP+2	SET LEFT END-POINT TO ZERO	DFQ20030
	LAC	B,7		DFQ20040
	LDQ	B+1,7	FIND BIGGER (IN ABSOLUTE	DFQ20050
	STQ	TEMP+3	VALUE) OF THE TWO END-POINTS	DFQ20060
+	THS	TEMP+3		DFQ20070
	STA	TEMP+3		DFQ20080
	LDQ	TEMP+3		DFQ20090
	SLJ	UPPER		DFQ20100
REPEAT1	SLJ	**		DFQ20110
	STQ	TEMP	Y=BASE	DFQ20120
	LDQ	F1		DFQ20130
	STQ	TEMP+1	P=1.	DFQ20140
LOOPLOOP	ENQ	0		DFQ20150
	LRS	1	J=J/2	DFQ20160
	STA	J		DFQ20170
	QJP,ZR	REPEAT2	SKIP MULTIPLICATION OF P BY Y	DFQ20180
	LDA	TEMP	IF LOW-ORDER BIT OF J IS ZERO	DFQ20190
	LDQ	TEMP+1		DFQ20200
	RTJ	SPOPSMUL	P=P*Y	DFQ20210
+	SLJ	REPEAT1	EXIT TO STA/STQ	DFQ20220
REPEAT2	LDA	TEMP		DFQ20230
	LDQ	TEMP		DFQ20240

	RTJ	SPOPSMUL	Y=Y*Y	DFQ20250
+	STA	TEMP		DFQ20260
	LDA	J		DFQ20270
	AJP,NZ	LOOPLOOP	END IF J=0	DFQ20280
	LDA	REPEAT1	SET UP EXIT	DFQ20290
	ARS	24		DFQ20300
	INA	1		DFQ20310
	SAU	**+1		DFQ20320
+	SLJ	**	EXIT	DFQ20330
IN1	SLJ	**	INITIALIZATION FOR Q1Q	DFQ20340
	SIU	END1,1		DFQ20350
	LIU	IN1,1		DFQ20360
	INI	-2,1		DFQ20370
	STA	=SSAVA		DFQ20380
	RAO	0,1		DFQ20390
	SIU	**+1,1	A44. OF CALL TO IN1	DFQ20400
	SIU	EXIT,1	SET UP EXIT	DFQ20410
	LIL	**,1		DFQ20420
	INI	-1,1		DFQ20430
	LDA	0,1		DFQ20440
	STA	A		DFQ20450
	INA	1		DFQ20460
	STA	A+1		DFQ20470
	LDA	SAVA	RESTORE A	DFQ20480
END1	ENI	**,1		DFQ20490
	SLJ	IN1	EXIT	DFQ20500
IN2	SLJ	**	INITIALIZATION FOR Q2Q	DFQ20510
	SIU	END2,1		DFQ20520
	LIU	IN2,1	ADD.+1 OF CALL TO IN2	DFQ20530
	INI	-2,1		DFQ20540
	SIU	**+1,1		DFQ20550
	STA	SAVA	SAVE A	DFQ20560
+	LIL	**,1		DFQ20570
	SIU	EX2,1		DFQ20580
	INI	1,1		DFQ20590
	LDA	0,1	CALL TO Q2Q	DFQ20600
	STA	B		DFQ20610
	INA	1		DFQ20620
	STA	B+1		DFQ20630
	INI	1,1		DFQ20640
	LDA	0,1		DFQ20650
	STA	A		DFQ20660
	INA	1		DFQ20670
	STA	A+1		DFQ20680
	LDA	SAVA	RESTORE A	DFQ20690
END2	ENI	**,1	RESTORE I1	DFQ20700

	SLJ	IN2		DFQ20710
EXIT	SLJ	**	EXIT FOR Q1Q'S	DFQ20720
EX2	SLJ	**	EXIT FOR Q2Q'S	DFQ20730
FIX	SLJ	**		DFQ20740
	AJP,MI	FIXNEG	EXIT FOR NEGATIVE	DFQ20750
	FAD	HEXP	POSITION COEFFICIENT IN A	DFQ20760
	SCL	HEXP	CLEAR HIGH BITS	DFQ20770
	SLJ	FIX		DFQ20780
FIXNEG	FSB	HEXP		DFQ20790
	SST	HEXP		DFQ20800
	SLJ	FIX		DFQ20810
HEXP	OCT	2044400000000000		DFQ20820
FLOAT	SLJ	**	FLOAT FIXED-POINT NUMBER	DFQ20830
	AJP,MI	FLN		DFQ20840
	SST	MONE	PUT IN EXPONENT	DFQ20850
	FAD	PZERO	NORMALIZE	DFQ20860
	SLJ	FLOAT		DFQ20870
FLN	SCL	MONE	PUT IN NEGATIVE EXPONENT	DFQ20880
	FAD	PZERO		DFQ20890
	SLJ	FLOAT		DFQ20900
MAXMIN	SLJ	**		DFQ20910
+	THS	=STMAX	TEST FOR MAXIMUM	DFQ20920
	STA	TMAX	A.GT.TMAX	DFQ20930
	STQ	=SSAVQ		DFQ20940
	LDA	SAVQ		DFQ20950
+	THS	=STMIN	TEST FOR MINIMUM	DFQ20960
	SLJ	MAXMIN		DFQ20970
	STA	TMIN	A.LE.TMIN	DFQ20980
	SLJ	MAXMIN		DFQ20990
ALSEV	OCT	-0		DFQ21000
MONE	OCT	2044000000000000		DFQ21010
PZERO	OCT	0		DFQ21020
F1	OCT	2001400000000000		DFQ21030
	END			DFQ21040
	IDENT	SPOPS	SPECIAL OPERATIONS FOR THE	DFQ21050
	CODAP			DFQ21060
OVERFLOW	BLOCK	1		DFQ21070
	COMMON	INDCATOR		DFQ21080
	ORGR	*		DFQ21090
INIT	SLJ	**	INTERVAL PACKAGE. ARGUMENTS ARE	DFQ21100
	STQ	=SX	IN A AND Q. ANSWERS ARE-	DFQ21110
	AJP	3 NEGA	UPPER LIMIT IN A,	DFQ21120
	LDQ	=01	LOWER LIMIT IN Q.	DFQ21130
RET1	STQ	=SSA	STORE SIGN(A)	DFQ21140
	LQC	M12		DFQ21150
	STL	=SMA	MANTISSA(A)	DFQ21160

	ARS	36		DFQ21170
	INA	-2000B		DFQ21180
	AJP	*+2		DFQ21190
	AJP	2 *+1	IF NEGATIVE - INCREASE BY 1	DFQ21200
	INA	1		DFQ21210
	STA	=SEA		DFQ21220
	LDA	X		DFQ21230
	AJP	3 NEGX		DFQ21240
	LDQ	=01		DFQ21250
RET2	STQ	=SSX	STORE SIGN(X)	DFQ21260
	LQC	M12		DFQ21270
	STL	=SMX	MANTISSA(X)	DFQ21280
	ARS	36		DFQ21290
	INA	-2000B		DFQ21300
	AJP	*+2		DFQ21310
	AJP	2 *+1	IF NEGATIVE - INCREASE BY 1	DFQ21320
	INA	1		DFQ21330
	STA	=SEX		DFQ21340
	SLJ	INIT	--RETURN--	DFQ21350
NEGA	SCM	ALSEV	COMPLEMENT A IF NEGATIVE	DFQ21360
	LQC	=01	-1 TO SIGN(A)	DFQ21370
	SLJ	RET1		DFQ21380
NEGX	SCM	ALSEV	COMPLEMENT X IF NEGATIVE	DFQ21390
	LQC	=01	-1 TO SIGN(X)	DFQ21400
	SLJ	RET2		DFQ21410
M12	OCT	7777000000000000		DFQ21420
ALSEV	OCT	-0		DFQ21430
N12	OCT	777777777777		DFQ21440
N13	OCT	4000777777777777		DFQ21450
HERD	SLJ	**	-COLLECT BITS AND PIECES-	DFQ21460
	STA	=STEMP	SAVE A	DFQ21470
+	LDA	EA		DFQ21480
+	AJP	2 *+1		DFQ21490
	SCM	=0777777777777777		DFQ21500
+	THS	=01777		DFQ21510
	SLJ	OFLOW		DFQ21520
+	LDA	EA	RE-NORMALIZE EXPONENT WRT. 2000	DFQ21530
	AJP	*+2		DFQ21540
	AJP	2 *+1		DFQ21550
	INA	-1		DFQ21560
	INA	2000B		DFQ21570
	ALS	36		DFQ21580
	SCL	N13		DFQ21590
	STA	EA		DFQ21600
	SST	TEMP	FLOAT A	DFQ21610
	QJP	NOCARRY	EXECT IF Q=0	DFQ21620

	FAD	=00	NORMALIZE	DFQ21630
	STA	=SSAVA		DFQ21640
	MUI	SA	MULTIPLY BY SIGN	DFQ21650
	STA	=SSAVB		DFQ21660
	LDA	EA		DFQ21670
	INA	1	EXPONENT WITH LOW-ORDER 1	DFQ21680
	FAD	SAVA	ADD TO CHOPPED NUMBER FOR UPPER	DFQ21690
	MUI	SA	MULTIPLY BY SIGN	DFQ21700
	AJP	3 FLIP		DFQ21710
RET3	LDQ	SAVB		DFQ21720
	SLJ	HERD		DFQ21730
FLIP	LRS	48	A TO Q	DFQ21740
	LDA	SAVB	CHOPPED NUMBER TO A	DFQ21750
	SLJ	HERD		DFQ21760
NOCARRY	MUI	SA	EXACT NUMBER TO A	DFQ21770
	FAD	=00		DFQ21780
	STA	SAVB	AND Q	DFQ21790
	SLJ	RET3		DFQ21800
	ENTRY	SPOPSADD	SP. ADDITION	DFQ21810
SPOPSADD	SLJ	**		DFQ21820
	RTJ	INIT	GO TO INITIALIZE	DFQ21830
	LDA	EA		DFQ21840
	SUB	EX	EA-EX	DFQ21850
	AJP	3 SWITCH	SWITCH IF EX.GT.EA	DFQ21860
RET4	ENQ	0		DFQ21870
+	THS	=0110		DFQ21880
	SLJ	SKIPS		DFQ21890
REASON	SAU	*+1	SHIFT ADDRESS=EA-EX	DFQ21900
	LDA	MX		DFQ21910
	LRS	**	LINE UP MX WITH MA	DFQ21920
RET8	STA	MX		DFQ21930
	LDA	SA	COMPARE SIGNS OF X AND A	DFQ21940
	ADD	SX		DFQ21950
	AJP	SUBTRACT	SUBTRACT IF DIFFERENT SIGNS	DFQ21960
	LDA	MA		DFQ21970
	ADD	MX		DFQ21980
	STA	=STEMP	SAVE SUM	DFQ21990
	SCL	N12	TEST FOR OVERFLOW	DFQ22000
	AJP	NOVER	EXIT FOR NO OVERFLOW	DFQ22010
	LDA	EA		DFQ22020
	INA	1		DFQ22030
	STA	EA		DFQ22040
	LDA	TEMP	AND SHIFT RIGHT BY 1	DFQ22050
	LRS	1		DFQ22060
RET6	RTJ	HERD	GO TO COLLECT	DFQ22070
+	SLJ	SPOPSADD	--EXIT--	DFQ22080

SKIPS	LDA		MX		DFQ22090
	AJP		RET8		DFQ22100
	ENQ		2		DFQ22110
	ENA		0		DFQ22120
	SLJ		RET8		DFQ22130
NOVER	LDA		TEMP	RELOAD ACC	DFQ22140
	SLJ		RET6		DFQ22150
SUBTRACT	LDA		MA	SUBTRACT MX FROM MA	DFQ22160
	SUB		MX	-NO OVERFLOW POSSIBLE	DFQ22170
	AJP	3	NEGATE	IF NEGATIVE - COMPLEMENT, SIGN	DFQ22180
	QJP		RET6	NO RESIDUE-EXIT	DFQ22190
	INA		-1	NEGATIVE RESIDUE-DECREASE MANTIS	DFQ22200
	STQ		=SSTORE		DFQ22210
+	AJP	2	*+1		DFQ22220
	ENA		0		DFQ22230
	LQC		STORE		DFQ22240
	SIU	1	GOOUT		DFQ22250
+	ENI	1	83		DFQ22260
	SIU	1	*+1		DFQ22270
+	SCQ	1	**		DFQ22280
	LRS		11		DFQ22290
	STA		TEMP		DFQ22300
	LDA		EA		DFQ22310
	INA	1	-72		DFQ22320
	STA		EA		DFQ22330
GOOUT	ENI	1	**		DFQ22340
	SLJ		NOVER		DFQ22350
NEGATE	LQC		SA	CHANGE SIGN OF RESULT	DFQ22360
	STQ		SA	COMPLEMENT ACC	DFQ22370
	SCM		ALSEV	NO RESIDUE IN Q POSSIBLE	DFQ22380
	ENQ		0		DFQ22390
	SLJ		RET6		DFQ22400
SWITCH	STA		TEMP	INTERCHANGE X AND A	DFQ22410
	LDA		EA		DFQ22420
	LDQ		EX		DFQ22430
	STA		EX		DFQ22440
	STQ		EA		DFQ22450
	LDA		MA		DFQ22460
	LDQ		MX		DFQ22470
	STQ		MA		DFQ22480
	STA		MX		DFQ22490
	LDA		SX		DFQ22500
	LDQ		SA		DFQ22510
	STA		SA		DFQ22520
	STQ		SX		DFQ22530
	LAC		TEMP	CHANGE SIGN OF (EA-EX)	DFQ22540

	SLJ	RET4		DFQ22550
	ENTRY	SPOPSMUL	SP•MULTIPLICATION	DFQ22560
SPOPSMUL	SLJ	**		DFQ22570
	RTJ	INIT		DFQ22580
	LDA	EA		DFQ22590
	ADD	EX	ADD EXPONENTS	DFQ22600
	STA	EA	NEW EXPONENT	DFQ22610
	LDA	SA		DFQ22620
	MUI	SX		DFQ22630
	STA	SA	NEW SIGN=SA*SX	DFQ22640
	LDA	MX		DFQ22650
	ALS	11	LEFT-JUSTIFY MULTIPLIER	DFQ22660
	MUF	MA	FORM PRODUCT-NO OVERFLOW POSSIBLE	DFQ22670
	RTJ	ADJUST		DFQ22680
+	RTJ	HERD		DFQ22690
+	SLJ	SPOPSMUL	--EXIT	DFQ22700
	ENTRY	SPOPSDIV	SP•DIVISION	DFQ22710
SPOPSDIV	SLJ	**		DFQ22720
	RTJ	INIT		DFQ22730
	LDA	EA		DFQ22740
	SUB	EX	NEW EXPONENT=EA-EX+2000	DFQ22750
	INA	1		DFQ22760
	STA	EA		DFQ22770
	LDA	SA	NEW SIGN=SA*SX	DFQ22780
	MUI	SX		DFQ22790
	STA	SA		DFQ22800
	LDA	MX	LEFT-JUSTIFY DIVISOR	DFQ22810
	ALS	11		DFQ22820
	STA	TEMP		DFQ22830
	LDA	MA		DFQ22840
	ENQ	0		DFQ22850
	LRS	1	DIVIDE-NO OVERFLOW POSSIBLE	DFQ22860
	DVF	TEMP		DFQ22870
	RTJ	ADJUST		DFQ22880
+	RTJ	HERD		DFQ22890
+	SLJ	SPOPSDIV		DFQ22900
MASKMM	OCT	377777777777		DFQ22910
ADJUST	SLJ	**		DFQ22920
	STA	TEMP		DFQ22930
	SCL	MASKMM		DFQ22940
	AJP	1 ADJUSTA		DFQ22950
	RSO	EA		DFQ22960
	LDA	TEMP		DFQ22970
	LLS	1		DFQ22980
	SLJ	ADJUST		DFQ22990
ADJUSTA	LDA	TEMP		DFQ23000

	SLJ	ADJUST	DFQ23010
OFLOW	LDQ	EA	DFQ23020
	QJP	2 OVERI	DFQ23030
	LDA	=0400000000000	DFQ23040
	MUI	SA	DFQ23050
	STA	=SSAVA	DFQ23060
	ENQ	0	DFQ23070
	STQ	=SSAVB	DFQ23080
	AJP	3 FLIP	DFQ23090
	SLJ	HERD	DFQ23100
OVERI	ENQ	1	DFQ23110
	STQ	INDCATOR	DFQ23120
	LDA	=0377777777777777	DFQ23130
	MUI	SA	DFQ23140
	STA	=SSAVA	DFQ23150
	STA	=SSAVB	DFQ23160
	LDQ	SAVB	DFQ23170
	SLJ	HERD	DFQ23180
	END		DFQ23190
	FUNCTION LIBINT (ARG)		DFQ23200
	DIMENSION ARG(2),ANS(2)		DFQ23210
	DIMENSION P(6),ARR(2),PIB2(2),TWOPY(2)		DFQ23220
	EQUIVALENCE (PI02,PIB2),(TWOPY,TWOPI)		DFQ23230
	EQUIVALENCE (LI,SLI),(RI,SRI)		DFQ23240
	EQUIVALENCE (DY,ANS)		DFQ23250
	EQUIVALENCE (PI,P(1)),(PI2,P(3)),(PI3,P(5)),(ARGT,ARR)		DFQ23260
	TYPE INT5(2) D,DY,LIBINT		DFQ23270
	TYPE INT5 (2) ARGT,PI02,TWOPI		DFQ23280
	TYPE DOUBLE DLOG,DEXP,DCOS,DATAN,DSQRT		DFQ23290
	TYPE DOUBLE PI,PI2,PI3,LI,RI,AL,AR,T1,T2,X		DFQ23300
	DATA(P=2002622077325042B,0550604323046146B,2003622077325042B,		DFQ23310
1	0550604323046146B,2004455457437631B,4416443236234514B)		DFQ23320
	DATA(PIB2=2001622077325042B,2001622077325043B),		DFQ23330
1	(TWOPY=2003622077325042B,2003622077325043B)		DFQ23340
	ENTRY LOG5		DFQ23350
	IF(ARG(1))1,1,2		DFQ23360
1	PRINT 19		DFQ23370
19	FORMAT(26H ERROR IN TYPE 5 FUNCTION)		DFQ23380
	RETURN		DFQ23390
2	X=ARG(1)		DFQ23400
	LI=DLOG(X)		DFQ23410
	X=ARG(2)		DFQ23420
	RI=DLOG(X)		DFQ23430
3	CALL ENDPTS (LI,RI,36)		DFQ23440
4	ANS(1)=SLI		DFQ23450
	ANS(2)=SRI		DFQ23460

5	LIBINT=DY	DFQ23470
	RETURN	DFQ23480
	ENTRY SQRT5	DFQ23490
	IF(ARG(1)) 1,1,11	DFQ23500
11	X=ARG(1)	DFQ23510
	LI=DSQRT(X)	DFQ23520
	X=ARG(2)	DFQ23530
	RI=DSQRT(X)	DFQ23540
	GO TO 3	DFQ23550
	ENTRY EXP5	DFQ23560
	X=ARG(1)	DFQ23570
	LI=DEXP(X)	DFQ23580
	X=ARG(2)	DFQ23590
	RI=DEXP(X)	DFQ23600
	CALL ENDPTS (LI,RI,36)	DFQ23610
	IF(LI)6,4,4	DFQ23620
6	LI=0.0D	DFQ23630
	GO TO 4	DFQ23640
	ENTRY SIN5	DFQ23650
	ARR(1)=ARG(1)	DFQ23660
	ARR(2)=ARG(2)	DFQ23670
	ARGT=PI02-ARGT	DFQ23680
	AL=ARR(1)	DFQ23690
	GO TO 100	DFQ23700
	ENTRY COS5	DFQ23710
	AL=ARR(1)=ARG(1)	DFQ23720
	ARR(2)=ARG(2)	DFQ23730
100	K=AL/PI2	DFQ23740
	IF(AL)101,102,102	DFQ23750
101	K=K-1	DFQ23760
102	ARGT=ARGT-K*TWOPI	DFQ23770
	AL=ARR(1)	DFQ23780
	AR=ARR(2)	DFQ23790
	T1=AL-PI	DFQ23800
	IF(T1)110,110,120	DFQ23810
110	T1=AR-PI2	DFQ23820
	IF(T1)112,111,111	DFQ23830
111	ANS(1)=-1.	DFQ23840
	ANS(2)=1.	DFQ23850
	GO TO 5	DFQ23860
112	T1=AR-PI	DFQ23870
	IF(T1)113,114,114	DFQ23880
113	LI=DCOS(AR)	DFQ23890
	RI=DCOS(AL)	DFQ23900
	GO TO 3	DFQ23910
114	T1=DCOS(AL)	DFQ23920

	T2=DCOS(AR)	DFQ23930
	IF(T1-T2)115,115,116	DFQ23940
115	RI=T2	DFQ23950
	GO TO 117	DFQ23960
116	RI=T1	DFQ23970
117	CALL ENDPTS (LI,RI,36)	DFQ23980
	LI=-1.	DFQ23990
	GO TO 4	DFQ24000
120	T1=AR-PI3	DFQ24010
	IF(T1)121,111,111	DFQ24020
121	T1=AR-PI2	DFQ24030
	IF(T1)122,123,123	DFQ24040
122	LI=DCOS(AL)	DFQ24050
	RI=DCOS(AR)	DFQ24060
	GO TO 3	DFQ24070
123	T1=DCOS(AL)	DFQ24080
	T2=DCOS(AR)	DFQ24090
	IF(T1-T2)124,124,125	DFQ24100
124	LI=T1	DFQ24110
	GO TO 126	DFQ24120
125	LI=T2	DFQ24130
126	CALL ENDPTS (LI,RI,36)	DFQ24140
	RI=1.	DFQ24150
	GO TO 4	DFQ24160
	ENTRY ATAN5	DFQ24170
	X=ARG(1)	DFQ24180
	LI=DATAN(X)	DFQ24190
	X=ARG(2)	DFQ24200
	RI=DATAN(X)	DFQ24210
	GO TO 3	DFQ24220
	ENTRY ABS5	DFQ24230
	IF(ARG(1))13,15,15	DFQ24240
13	IF(ARG(2)) 14,14,16	DFQ24250
16	ANS(1)=0.	DFQ24260
	IF(ARG(2)+ARG(1))17,18,18	DFQ24270
17	ANS(2)=-ARG(1)	DFQ24280
	GO TO 5	DFQ24290
18	ANS(2)=ARG(2)	DFQ24300
	GO TO 5	DFQ24310
14	ANS(2)=-ARG(1)	DFQ24320
	ANS(1)=-ARG(2)	DFQ24330
	GO TO 5	DFQ24340
15	ANS(1)=ARG(1)	DFQ24350
	ANS(2)=ARG(2)	DFQ24360
	GO TO 5	DFQ24370
	ENTRY CDFN5	DFQ24380

Y=ARG(1)	DFQ24390
LI=CDFN(Y)	DFQ24400
Y=ARG(2)	DFQ24410
RI=CDFN(Y)	DFQ24420
CALL ENDPTS (LI,RI,27)	DFQ24430
GO TO 4	DFQ24440
END	DFQ24450
SUBROUTINE ENDPTS(LEP,REP,NOBITS)	DFQ24460
TYPE REAL LEP	DFQ24470
IADJ=2**(36-NOBITS)	DFQ24480
EP=2.**(-NOBITS)	DFQ24490
ITEMP=IADJ-1	DFQ24500
IMASK=.NOT.ITEMP	DFQ24510
ZEP=ABSF(LEP)	DFQ24520
ASSIGN 20 TO IEND	DFQ24530
IF (LEP)200,100,100	DFQ24540
20 IF(LEP)21,22,22	DFQ24550
21 ANS=-ANS	DFQ24560
22 LEP=ANS	DFQ24570
ZEP=ABSF(REP)	DFQ24580
ASSIGN 30 TO IEND	DFQ24590
IF(REP)100,200,200	DFQ24600
30 IF(REP)31,32,32	DFQ24610
31 ANS=-ANS	DFQ24620
32 REP=ANS	DFQ24630
RETURN	DFQ24640
100 TEMP1=(ZEP.AND.7777000000000000B).OR.IADJ	DFQ24650
TEMP2=(ZEP.AND.IMASK)	DFQ24660
ANS=TEMP2-TEMP1	DFQ24670
IF(ABSF(ANS).LT.EP)101,102	DFQ24680
101 ANS=-EP	DFQ24690
102 GO TO IEND	DFQ24700
200 TEMP1=(ZEP.AND.7777000000000000B).OR.IADJ	DFQ24710
TEMP2=ZEP.AND.IMASK	DFQ24720
ANS=TEMP2+TEMP1+TEMP1	DFQ24730
IF(ABSF(ANS).LT.EP)201,202	DFQ24740
201 ANS=EP	DFQ24750
202 GO TO IEND	DFQ24760
END	DFQ24770
SUBROUTINE ERRORINT	DFQ24780
COMMON/OVERFLOW/INDCATOR	DFQ24790
INDCATOR=1	DFQ24800
RETURN	DFQ24810
END	DFQ24820

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