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TITLE: ROOTS OF A QUADRATIC PROGRAM NO.: PS.02-2200.01A-00FI-1-0 TAPE NO.: 701-0119

BLOCK NO.: 1

```
10 PRINT HEX(03)
20 PRINT "ROOTS OF QUADRATIC"
25 PRINT "A1, A2, A3"
30 INPUT A1, A2, A3
40 X1=-A2/(2*A1)
50 D=X1*X1-A3/A1
60 IF D<0THEN 90
70 X2=X1-SQR(D):X1=X1+SQR(D)
80 I1=0:I2=0:GOTO 100
90 X2=X1:I1=SQR(-D):I2=-SQR(-D)
100 PRINT "X1 REAL =";X1,"X2 REAL =";X2
110 IF  I1=0 THEN 140
120 PRINT "X1 IMAG =";I1,"X2 IMAG =";I2
130 PRINT "MORE INPUT (1=YES,0=NO)"
132 INPUT A:IF A=1THEN 20
135 END
140 IF I2=0 THEN 130
150 GOTO 120
160 END
```

TITLE: ROOTS OF A POLYNOMIAL PROGRAM NO.: PS.02-2200.01A-00FI-?-0 TAPE NO.: 701-0119

BLOCK NO.: 2

```
1 DIM B(22),E(22),W(22),C(22)
5 E0=1E-12: E1=1E-4: E4=1E-20: K1=100: S5=0
10 PRINT "DEGREE OF POLYNOMIAL?":INPUT N
15 PRINT "ENTER COEFF. : A0,A1,...,AN 1/LINE"
20 FOR I=1 TO N+1:INPUT B(N-I+2)
25 NEXT I:IF ABS(B(1))>=E0 THEN 35
30 PRINT "A(N) ZERO OR NEARLY ZERO. CALCULATIONS END.":GOTO 999

35 PRINT :PRINT "ROOTS:":IF N<=2 THEN 350
40 B(N+2)=0: N1=2*INT((N+1)/2)
45 FOR M1=1 TO N1/2: P,Q=1
50 FOR K=1 TO K1:FOR L=1 TO K1
55 FOR I=1 TO N1+1: C(I)=B(I):NEXT I
60 FOR J=N1-2 TO N1-4 STEP -2:FOR I=1 TO J+1
65 C(I+1)=C(I+1)-P*C(I): C(I+2)=C(I+2)-Q*C(I)
70 NEXT I:NEXT J
75 R0=C(N1+1): R1=C(N1)
80 S0=C(N1-1): S1=C(N1-2)
85 V0=-Q*S1: V1=S0-S1*P
90 D0=V1*S0-V0*S1:IF ABS(D0)>=E4 THEN 110
95 P=P+S: Q=Q+S
100 NEXT L
110 D1=S0*R1-S1*R0: D2=R0*V1-V0*R1
120 P1=D1/D0: Q1=D2/D0: P=P+P1: Q=Q+Q1
130 IF ABS(R0)>=E1 THEN 150:IF ABS(R1)>=E1 THEN 150
140 E(M1)=1:GOTO 210
150 IF ABS(P1)>=E1 THEN 170:IF ABS(Q1)>=E1 THEN 170
160 E(M1)=2:GOTO 210
170 IF P=0 THEN 180:IF ABS(P1/P)>=E1 THEN 200
180 IF Q=0 THEN 200:IF ABS(Q1/Q)>=E1 THEN 200
190 E(M1)=3:GOTO 210
200 NEXT K: E(M1)=4
210 S=-P/2: T=S*S-Q
220 IF T<0 THEN 240: T=SQR(T): W(M1)=1
230 PRINT :PRINT S+T:PRINT S-T:GOTO 260
240 W(M1)=-1: T=SQR(-T)
250 PRINT :PRINT S;"+I*";T:PRINT S;"-I*";T
260 IF E(M1)=4 THEN 999
270 FOR J=1 TO N1-1
280 B(J+1)=B(J+1)-P*B(J): B(J+2)=B(J+2)-Q*B(J)
290 NEXT J
300 N1=N1-2:IF N1>1 THEN 310:GOTO 999
310 IF N1>=3 THEN 340
320 M1=M1+1: E(M1)=1
330 P=B(2)/B(1): Q=B(3)/B(1):GOTO 210
340 NEXT M1
350 IF N=2 THEN 370
360 PRINT -B(2)/B(1):GOTO 999
370 B(3)=B(2)*B(2)-4*B(1)*B(3)
380 S=-B(2)/2/B(1): T=SQR(ABS(B(3)))/2/B(1)
390 M1,E(4)=4:IF SGN(B(3))<0 THEN 250:GOTO 230
999 END
```

TITLE: HALF-INTERVAL SEARCH FOR ROOTS

PROGRAM NO.: PS.02-2200.01A-00FI-3-0

TAPE NO.: 701-0119

BLOCK NO.: 3

```
100 DIM D(3)
105 PRINT "INTERVAL (LOWER LIMIT, UPPER LIMIT)?"
110 INPUT A,B
112 S=SGN(FNC(A))
115 T=SGN(FNC(B))
120 PRINT
130 IF S*T=0 THEN 800
140 IF S*T<0 THEN 500
200 FOR I=1 TO 1000
210     X=A+RND(Z)*(B-A)
220 V=SGN(FNC(X))
230 IF V=0 THEN 900
240 IF S*V<0 THEN 400
250 NEXT I
260 PRINT "NO CHANGE OF SIGN FOUND"
265 PRINT
270 GOTO 100
400 B=X
500 D(2+S)=A
510 D(2-S)=B
600 X=(D(1)+D(3))/2
610 U=SGN(FNC(X))
620 IF U=0 THEN 900
630 D(2+U)=X
640 IF ABS(D(1)-D(3))/(ABS(D(1))+ABS(D(3)))<5E-6 THEN 900
650 GOTO 600
800 IF S=0 THEN 850
810 X=T
820 GOTO 900
850 X=S
900 PRINT "ONE ROOT AT ",X
905 PRINT
910 GOTO 100
999 END
```

TITLE: REAL ROOTS OF A POLYNOMIAL PROGRAM NO.: PS.02-2200.01A-00FI-4-0 TAPE NO.: 701-0119

BLOCK NO.: 4

```
2 PRINT HEX(03)
5 DIM A(99)
10 PRINT "INPUT DEGREE OF POLYNOMIAL, N"
20 INPUT N
22 PRINT "INPUT COEFFICIENTS A(1),...,A(N+1) 4/LINE"
25 FOR I=0 TO INT((N+4)/4)-1
30 INPUT A(4*I+1),A(4*I+2),A(4*I+3),A(4*I+4)
35 NEXT I
40 PRINT "INPUT YOUR ESTIMATE OF ROOT"
45 INPUT X
50 FOR J=1 TO 100
55 F=A(N+1)
60 FOR I=1 TO N
70 T=T+X^2
80 F=F+A(I)*X^(N-I+1)
90 NEXT I
100 G=A(N)
110 FOR I=1 TO N-1
120 G=G+(N-I+1)*A(I)*X^(N-I)
130 NEXT I
140 I=X
150 X=X-F/G
160 IF ABS(X)+ABS(I)=0 THEN 900
165 IF X=0 THEN 200
170 IF ABS(1-I/X)<10E-8 THEN 900
200 NEXT J
210 PRINT "AFTER 100 ITERATIONS, NO CONVERGENCE"
220 GOTO 999
900 PRINT "ROOT IS: ",X
999 PRINT "ANOTHER ROOT (1=YES,0=NO)":INPUT L:IF L=1THEN 40:END
```

TITLE: SIMPSON'S RULE PROGRAM NO.: PS.02-2200.01A-00FI-5-0 TAPE NO.: 701-0119

BLOCK NO.: 5

```
15 READ Z,A,B,D
20 S,T=0
30 IF Z=1 THEN 60
40 READ Y1
50 GOTO 80
60 Y1=FNC(A)
70 Y2=FNC(B)
80 FOR I=1 TO (B-A)/D-.5
90 IF Z=1 THEN 120
100 READ Y
110 GOTO 130
120 Y=FNC(A+I*D)
130 IF I/2=INT(I/2) THEN 160
140 S=S+Y
150 GOTO 170
160 T=T+Y
170 NEXT I
180 IF Z=1 THEN 200
190 READ Y2
200 PRINT "INTEGRAL=";D/3*(Y1+4*S+2*T+Y2)
999 END
```

TITLE: NUMERICAL INTEGRATION PROGRAM NO.: PS.02-2200.01A-00FI-6-0 TAPE NO.: 701-0119

(ROMBERG'S METHOD) BLOCK NO.: 6

```
5 DIM T(8)
10 PRINT "INPUT 'LOWER LIMIT, UPPER LIMIT' (TO END PROGRAM INPUT
"
11 PRINT "EQUAL LIMITS)"
20 INPUT X1,X2
30 IF X2=X1 THEN 999
40 L=X2-X1
50 Y1=FNC(X1)
60 Y=FNC(X2)
70 T(1)=(Y1+Y)/2
80 N=1
90 FOR H=1 TO 7
100 U=0
110 M=L/(2*N)
120 FOR J=1 TO 2*N-1 STEP 2
130 Y=FNC(X1+J*M)
140 U=U+Y
150 NEXT J
160 T(H+1)=(U/N+T(H))/2
170 F=1
180 FOR J=H TO 1 STEP -1
190 F=F*4
200 T(J)=T(J+1)+(T(J+1)-T(J))/(F-1)
210 NEXT J
220 N=2*N
230 I2=T(1)*L
240 IF H=1 THEN 260
250 IF ABS(I1-I2)<=1E-4*ABS(I2) THEN 400
260 I1=I2
270 NEXT H
280 PRINT "UNABLE TO COMPUTE INTEGRAL TO 4 SIGNIFICANT DIGITS."
290 PRINT "CLOSEST APPROXIMATION IS:"; I2
295 PRINT
300 PRINT "INPUT 'LOWER LIMIT, UPPER LIMIT'"
310 GOTO 20
400 PRINT "INTEGRAL= "; I2
410 GOTO 295
999 END
```

```
1 DIM X(20),F(10),K(4,10)
3 GOTO 100
5 REM --SUBROUTINE
99 RETURN
210 PRINT "T                ",
220 READ N,T
230 FOR I=1 TO N
240 READ X(I)
259 PRINT "X";I,,
260 NEXT I
270 READ D,B
280 A=T
285 FOR J=A TO B STEP D
286 PRINT
288 PRINT T,
290 FOR I=1 TO N
292 PRINT X(I),
294 NEXT I
300 FOR I=1 TO N
310 X(N+I)=X(I)
320 NEXT I
330 GOSUB 5
340 FOR I=1 TO N
350 K(1,I)=F(I)
360 NEXT I
370 D1=D/2
380 T=T+D1
390 FOR L=1 TO 3
400 T=T+INT(L/3)*D1
410 FOR I=1 TO N
420 X(I)=X(N+I)+D1*K(L,I)*INT(L/3+1)
430 NEXT I
440 GOSUB 5
450 FOR I=1 TO N
460 K(L+1,I)=F(I)
470 NEXT I
480 NEXT L
610 FOR I=1 TO N
620 X(I)=X(N+I)+D/6*(K(1,I)+2*K(2,I)+2*K(3,I)+K(4,I))
630 NEXT I
640 NEXT J
999 END
```

TITLE: GAUSSIAN QUADRATURE (20-POINT)

PROGRAM NO.: PS.02-2200.01A-00FI-3-0

TAPE NO.: 701-0119

BLOCK NO.: 8

```
10 PRINT "ENTER LOWER LIMIT OF INTEGRATION,UPPER LIMIT OF INTEGR
ATION"
20 INPUT A,B
30 PRINT "ENTER NO. OF SUBINTERVALS"
40 INPUT K
90 C=(B-A)/K/2
110 D=A+C
115 T=0
120 FOR J=1 TO K
130 S=0
140 FOR I=1 TO 10
150READ X,W
160 S=S+W*(FNC(C*X+D)+FNC(D-C*X))
170 NEXT I
175 RESTORE
180 T=T+S*C
185 D=D+2*C
190 NEXT J
200 PRINT "INTEGRAL= ";T
210 PRINT
220 PRINT "CHANGE NUMBER OF SUBINTERVALS? ('1'--YES,'0'--NO)"
230 INPUT I
240 IF I=1 THEN 30
250 PRINT "NEW INTEGRATION LIMITS? ('1'--YES,'0'--NO)"
260 INPUT I
270 IF I=1 THEN 10
300 DATA 76526521E-9,.15275339,.22778585,.14917299,.37370609,.14
209611
310 DATA .510867,.13168864,.63605368,.11819453,.74633191,.101930
12
320 DATA .83911697,83276742E-9,.91223443,62672048E-9,.96397193
330 DATA 4060143E-8,.9931286,17614007E-9
999 END
```

TITLE: "ERIVATIVE PROGRAM NO.: PS.'2-2200.'1A-'0FI-9-0 TAPE NO.: 701-0119

(DIFFERENCE QUOTIENTS) BLOCK NO.: 9

```
5 PRINT "ENTER VALUE OF X.  (TO END PROGRAM INPUT 99999)"
10 INPUT A
12 IF A=99999 THEN 90
15 PRINT
20 PRINT " X", "DIFFERENCE QUOTIENT"
25 D=0
30 FOR N=1 TO 10
35 D1=D
40 X=A+.5^N
45 D=(FNC(X)-FNC(A))/(X-A)
50 PRINT INT(X*1E4+.5)/1E4, D
55 NEXT N
60 PRINT
65 PRINT "DERIVATIVE AT X="; A; "IS:"; 2*D-D1
70 PRINT
80 PRINT "ENTER VALUE OF X"
85 GOTO 10
90 END
```

TITLE: MATRIX INVERSION (GAUSS-JORDAN ELIMINATION METHOD)

PROGRAM NO.: PS.02-2200.01A-00FI-10-0

TAPE NO.: 701-0119

BLOCK NO.: 10

```
5 DIM A(6,7),Z(6,6)
10 PRINT "INPUT N":INPUT N
20 PRINT "INPUT MATRIX"
30 FOR S=1 TO N
40 INPUT A(S,1),A(S,2),A(S,3),A(S,4),A(S,5),A(S,6),A(S,7)
60 Z(S,S)=1:NEXT S
70 FOR S=1 TO N
80 FOR T=S TO N:IF A(T,S)<>0 THEN 100:NEXT T
90 PRINT "MATRIX SINGULAR":GOTO 999
100 GOSUB 500
110 C=1/A(S,S):GOSUB 600
120 FOR T=1 TO N:IF T=S THEN 140
130 C=-A(T,S):GOSUB 700
140 NEXT T:NEXT S:GOTO 800
500 FOR J=1 TO N
510 B=A(S,J): A(S,J)=A(T,J): A(T,J)=B
520 B=Z(S,J): Z(S,J)=Z(T,J): Z(T,J)=B
530 NEXT J:RETURN
600 FOR J=1 TO N
610 A(S,J)=C*A(S,J): Z(S,J)=C*Z(S,J)
620 NEXT J:RETURN
700 FOR J=1 TO N
710 A(T,J)=A(T,J)+C*A(S,J): Z(T,J)=Z(T,J)+C*Z(S,J)
720 NEXT J:RETURN
800 PRINT
810 FOR I=1 TO N:FOR J=1 TO N
820 PRINT Z(I,J), :NEXT J:PRINT :NEXT I
999 END
```

TITLE: MATRIX INVERSION (GAUSS-JORDAN DONE IN PLACE) PROGRAM NO.: PS.02-2200.01A-00FI-11-0 TAPE NO.: 701-0119

BLOCK NO.: 11

```
5 DIM A(10,11),V(10)
10 PRINT "ENTER N":INPUT N
15 PRINT "ENTER MATRIX"
20 FOR S=1 TO N
25 INPUT A(S,1),A(S,2),A(S,3),A(S,4),A(S,5),A(S,6),A(S,7),A(S,8)
,          A(S,9),A(S,10),A(S,11)
30 NEXT S
35 FOR S=1 TO N
40 FOR T=S TO N:IF A(T,S)<>0 THEN 50:NEXT T
45 PRINT "MATRIX SINGULAR":GOTO 999
50 GOSUB 500
55 A(S,S)=1/A(S,S):GOSUB 600
60 FOR T=1 TO N:IF T=S THEN 70
65 B=-A(T,S): A(T,S)=0:GOSUB 700
70 NEXT T:NEXT S
100 FOR S=N TO 1 STEP -1:IF V(S)=S THEN 140
110 FOR J=1 TO N
120 B=A(J,S): A(J,S)=A(J,V(S)): A(J,V(S))=B
130 NEXT J
140 NEXT S:GOTO 800
500 FOR J=1 TO N
510 B=A(S,J): A(S,J)=A(T,J): A(T,J)=B
520 NEXT J: V(S)=T:RETURN
600 FOR J=1 TO N:IF J=S THEN 620
610 A(S,J)=A(S,S)*A(S,J)
620 NEXT J:RETURN
700 FOR J=1 TO N
710 A(T,J)=A(T,J)+B*A(S,J)
720 NEXT J:RETURN
800 FOR I=1 TO N:PRINT :FOR J=1 TO N:PRINT A(I,J),
810 NEXT J:PRINT :NEXT I
999 END
```

TITLE: EIGENVALUE AND EIGENVECTOR PROGRAM NO.: PS.02-2200.01A-00FI-12-0 TAPE NO.: 701-0119

BLOCK NO.: 12

```
10 DIM A(5,6),S(5,5)
20 R=.00001
30 PRINT "INPUT N":INPUT N
40 PRINT "INPUT MATRIX"
50 FOR I=1 TO N
60 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),A(I,8)
,          A(I,9),A(I,10)
75 NEXT I
80 FOR I=1 TO N: S(I,I)=1:NEXT I
90 FOR I=2 TO N:FOR J=1 TO I-1
100 I1=I1+2*A(I,J)^2
110 NEXT J:NEXT I
130 N1=SQR(I1): N2=(R/N)*N1: T=N1
140 T=T/N
150 FOR Q=2 TO N:FOR P=1 TO Q-1
160 IF ABS(A(P,Q))<=T THEN 320
170 I2=1
180 V1=A(P,P): V2=A(P,Q): V3=A(Q,Q)
190 M1=(V1-V3)*.5:IF M1<>0 THEN 210
200 W=-1:GOTO 220
210 W=-SGN(M1)*V2/SQR(V2^2+M1^2)
220 T1=W/SQR(2*(1+SQR(1-W/2))): T2=T1^2
230 C1=SQR(1-T2): C2=C1^2: T3=T1*C1
240 FOR I=1 TO N
250 I1=A(I,P)*C1-A(I,Q)*T1: A(I,Q)=A(I,P)*T1+A(I,Q)*C1
260 A(I,P)=I1: I1=S(I,P)*C1-S(I,Q)*T1
270 S(I,Q)=S(I,P)*T1+S(I,Q)*C1:S(I,P)=I1
280 NEXT I
290 FOR I=1 TO N: A(P,I)=A(I,P): A(Q,I)=A(I,Q):NEXT I
300 A(P,P)=V1*C2+V3*T2-2*V2*T3: A(Q,Q)=V1*T2+V3*C2+2*V2*T3
310 A(P,Q)=(V1-V3)*T3+V2*(C2-T2): A(Q,P)=A(P,Q)
320 NEXT P
330 NEXT Q
340 IF I2<>1 THEN 360
350 I2=0:GOTO 150
360 IF T>N2 THEN 140
370 PRINT "EIGENVALUE","EIGENVECTOR":PRINT
380 FOR I=1 TO N:PRINT A(I,I),S(1,I)
390 FOR J=2 TO N:PRINT " ",S(J,I):NEXT J
400 PRINT :PRINT :NEXT I
999 END
```

TITLE: VECTOR OPERATIONS PROGRAM NO.: PS.02-2200.01A-00FI-13-0 TAPE NO.: 701-0119

BLOCK NO.: 13

```
5 PRINT "VECTOR A?"
10 INPUT X1,Y1,Z1
15 PRINT "VECTOR B?"
20 INPUT X2,Y2,Z2
25 PRINT
30 PRINT "A+B=(";X1+X2;",";Y1+Y2;",";Z1+Z2;")"
35 PRINT "A-B=(";X1-X2;",";Y1-Y2;",";Z1-Z2;")"
40 PRINT "AB=";X1*X2+Y1*Y2+Z1*Z2
45 PRINT "AXB=(";Y1*Z2-Z1*Y2;",";Z1*X2-X1*Z2;",";X1*Y2-Y1*X2;")"

50 PRINT
55 PRINT "MORE INPUT? (1=YES,0=NO)"
60 INPUT X1
65 PRINT
70 IF X1=1 THEN 5
75 END
```

TITLE: VECTOR ANALYSIS PROGRAM NO.: PS.02-2200,01A-00FI-14-0 TAPE NO.: 701-0119

BLOCK NO.: 14

```
1 SELECT R
5 DIM X(6),M(4),A(3)
10 PRINT
15 PRINT "INPUT VECTORS 1/LINE (X,Y,Z,CARRIAGE RETURN)"
30 INPUT X(1),X(2),X(3)
40 INPUT X(4),X(5),X(6)
45 PRINT
50 FOR I=1 TO 4 STEP 3
60 M(I)=SQR(X(I)^2+X(I+1)^2+X(I+2)^2)
70 IF M(I)=0 THEN 180
80 PRINT "FOR VECTOR ";INT(I/4)+1
90 PRINT "  MAGNITUDE=";M(I)
100 FOR J=1 TO 3
110 B=X(I+J-1)/M(I)
120 A(J)=ATN(SQR(1-B^2)/B)*57.29578
130 NEXT J
140 PRINT "  ANGLE BETW. VECTOR AND X-AXIS=";A(1)
150 PRINT "  ANGLE BETW. VECTOR AND Y-AXIS=";A(2)
160 PRINT "  ANGLE BETW. VECTOR AND Z-AXIS=";A(3)
170 PRINT
180 NEXT I
185 B=0
190 IF M(1)=0 THEN 260
200 IF M(4)=0 THEN 260
210 B=(X(1)*X(4)+X(2)*X(5)+X(3)*X(6))/M(1)/M(4)
220 IF B<>0 THEN 250
230 B=90
240 GOTO 260
250 B=ATN(SQR(1-B^2)/B)*57.29578
260 PRINT "ANGLE BETW. VECTORS= ";B
280 PRINT
290 PRINT "MORE INPUT? (1=YES,0=NO)"
300 INPUT B
310 IF B=1 THEN 10
320 SELECT D :END
```

TITLE: SOLUTION OF SIMULTANEOUS EQUATIONS (GAUSS-JORDAN)

PROGRAM NO.: PS.02-2200.01A-00FI-15-0

TAPE NO.: 701-0110

BLOCK NO.: 15

```
5 DIM A(7,9)
10 PRINT "NO. OF UNKNOWNS?"
20 INPUT N
30 PRINT "INPUT 'AUGMENTED COEFFICIENT MATRIX'"
100 FOR I=1 TO N
120 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),
          A(I,8),A(I,9)
140 NEXT I
160 PRINT
210 FOR S=1 TO N
220 FOR T=S TO N
230 IF A(T,S)<>0 THEN 240
235 NEXT T
237 PRINT "NO UNIQUE SOLUTION"
238 GOTO 999
240 GOSUB 510
250 C=1/A(S,S)
260 GOSUB 610
270 FOR T=1 TO N
275 IF T=S THEN 300
280 C=-A(T,S)
290 GOSUB 710
300 NEXT T
305 NEXT S
310 GOTO 800
510 FOR J=1 TO N+1
520 B=A(S,J)
530 A(S,J)=A(T,J)
540 A(T,J)=B
550 NEXT J
560 RETURN
610 FOR J=1 TO N+1
620 A(S,J)=C*A(S,J)
630 NEXT J
640 RETURN
710 FOR J=1 TO N+1
720 A(T,J)=A(T,J)+C*A(S,J)
730 NEXT J
740 RETURN
800 FOR T=1 TO N
810 PRINT "X(";T;")=";A(T,N+1)
820 NEXT T
999 END
```

TITLE: MATRIX ADDITION, SUBTRACTION PROGRAM NO.: PS.02-2200.01A-00FI-16-0 TAPE NO.: 701-0119

AND SCALAR MULTIPLICATION BLOCK NO.: 16

```
5 DIM A(10,10),X(10)
10 PRINT "INPUT 1 (SCALAR MULT.) OR 2 (ADD) OR 3 (SUBTRACT)"
15 INPUT Z:IF Z>1 THEN 20:PRINT "INPUT SCALAR":INPUT R
20 PRINT "INPUT N,M":INPUT N,M
40 PRINT "INPUT MATRIX A"
50 FOR I=1 TO N
60 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),A(I,8)
,              A(I,9),A(I,10)
80 NEXT I
90 IF Z=1 THEN 170: R=1
100 PRINT "INPUT MATRIX B"
110 FOR I=1 TO N
115 INPUT X(1),X(2),X(3),X(4),X(5),X(6),X(7),X(8),X(9),X(10)
120 FOR K=1 TO M
130 IF Z=2 THEN 140: X(K)=-X(K)
140 A(I,K)=A(I,K)+X(K)
150 NEXT K
160 NEXT I
170 FOR I=1 TO N:PRINT :FOR J=1 TO M
180 PRINT R*A(I,J),:NEXT J:PRINT :NEXT I
190 END
```

TITLE: MATRIX MULTIPLICATION PROGRAM NO.: PS.02-2200.01A-00FI-17-0 TAPE NO.: 701-0119

BLOCK NO.: 17

```
1 DEFFN'0
5 DIM A(8,9),B(8,9),C(8)
10 PRINT HEX$(03)
20 PRINT "INPUT N,M,P": INPUT N,P,M
40 PRINT "INPUT MATRIX A"
50 FOR I=1 TO N
60 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),A(I,8)
,                A(I,9)
80 NEXT I: PRINT "INPUT MATRIX B"
90 FOR I=1 TO P
100 INPUT B(I,1),B(I,2),B(I,3),B(I,4),B(I,5),B(I,6),B(I,7),B(I,8
),             B(I,9)
120 NEXT I: FOR I=1 TO N: FOR J=1 TO M: FOR K=1 TO P
130 S=S+A(I,K)*B(K,J): NEXT K: C(J)=S: S=0: NEXT J
140 FOR J=1 TO M: A(I,J)=C(J): NEXT J: NEXT I
150 FOR I=1 TO N: PRINT : FOR J=1 TO M
160 PRINT A(I,J),:NEXT J:PRINT :NEXT I
170 END
```

TITLE: SOLUTION OF SIMULTANEOUS EQUATIONS

PROGRAM NO.: PS.02-2200.01A-00FI-18-0

TAPE NO.: 701-0119

BLOCK NO.: 18

```
5 DIM A(9,9),X(8)
10 PRINT "INPUT NO. OF UNKNOWNS, MAX. NO. OF ITERATIONS, DELTA"
15 INPUT N,M,D
20 PRINT "INPUT COEFF. MATRIX A AND THEN COLUMN MATRIX B"
100 FOR I=1 TO N+1
120 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),
               A(I,8),A(I,9)
140 NEXT I
170 FOR I=1 TO N
210 X(I)=A(N+1,I)
220 NEXT I
230 FOR K=1 TO M
310 T=0
320 FOR I=1 TO N
330 S=0
340 FOR J=1 TO N
350 S=S+A(I,J)*X(J)
360 NEXT J
370 B=X(I)
380 X(I)=(-S+A(I,I)*X(I)+A(N+1,I))/A(I,I)
390 IF ABS(X(I))<=ABS(B) THEN 420
400 IF ABS(B/X(I))<D THEN 440
410 GOTO 440
420 IF ABS(X(I)/B)<D THEN 440
430 T=T+1
440 NEXT I
450 IF T=N THEN 480
460 NEXT K
470 PRINT "CONVERGENCE TOO SLOW. LAST VALUES COMPUTED ARE:"
480 PRINT
485 FOR I=1 TO N
490 PRINT "X(";I;") =";X(I)
500 NEXT I
999 END
```

```
1 DIM A(10,14),X(13)
5 PRINT "NO. OF VARIABLES?": INPUT M
10 PRINT "NO. OF CONSTRAINTS?": INPUT N
15 PRINT "ENTER MATRIX A"
20 FOR I=2 TO N+1
25 INPUT A(I,1),A(I,2),A(I,3),A(I,4),A(I,5),A(I,6),A(I,7),A(I,8)
,             A(I,9)
30 A(I,N+M+1)=A(I,M+2): A(I,M+2)=0: IF I=2 THEN 40
35 A(I,M+I-1)=A(I,M+1): A(I,M+1)=0
40 NEXT I
45 PRINT "ENTER OBJECTIVE FUNCTION"
50 INPUT A(1,1),A(1,2),A(1,3),A(1,4),A(1,5),A(1,6)
55 PRINT : R=1
60 FOR I=1 TO M: X(I)=1: NEXT I
65 FOR I=2 TO N+1
70 IF A(I,M+I-1)<>-1 THEN 85: X(M+I-1)=1
75 FOR J=1 TO N+M: A(N+2,J)=A(N+2,J)-A(I,J): NEXT J
80 R=N+2
85 NEXT I
90 S,T=1
95 FOR I=2 TO N+M: IF A(R,I)<A(R,S) THEN 100: S=I
100 IF A(R,I)>=A(R,T) THEN 110: T=I
110 NEXT I
120 IF A(R,T)<0 THEN 140: IF R=1 THEN 300
130 IF A(R,S)>1E-4 THEN 280: R=1: GOTO 90
140 S=1
150 FOR I=2 TO N+1: IF A(I,T)<=0 THEN 190
160 Y=A(I,N+M+1)/A(I,T): IF S=1 THEN 180
170 IF Y>=A(S,N+M+1)/A(S,T) THEN 190
180 S=I
190 NEXT I
200 IF S=1 THEN 290
210 FOR I=1 TO N+M: IF X(I)=1 THEN 220: IF A(S,I)=1 THEN 230
220 NEXT I
230 X(I)=1: X(T)=0: Y=A(S,T)
240 FOR I=1 TO N+M+1: A(S,I)=A(S,I)/Y: NEXT I
250 FOR I=1 TO N+2: IF I=S THEN 270: Y=A(I,T)
260 FOR J=1 TO N+M+1: A(I,J)=A(I,J)-Y*A(S,J): NEXT J
270 NEXT I: GOTO 90
280 PRINT "INFEASIBLE": STOP
290 PRINT "UNBOUNDED": STOP
300 FOR J=1 TO M
310 IF X(J)=0 THEN 320: X(J)=0: GOTO 340
320 FOR I=2TO N+1: IF A(I,J)=1 THEN 330:NEXT I
330 X(J)=A(I,N+M+1)
340 NEXT J
350 Y=A(1,N+M+1)
360 PRINT :PRINT "OBJ. FUNC. =";Y:PRINT
370 FOR I=1TO M: PRINT "X(";I;")=";X(I): NEXT I
380 END
```

TITLE: COMPLEX DETERMINANT PROGRAM NO.: PS.02-2200.01A-00FI-20-0 TAPE NO.: 701-0119

BLOCK NO.: 20

```
1 DIM A(5,5),B(5,5)
5 PRINT "ENTER N": INPUT N
10 PRINT : PRINT "ENTER MATRIX"
15 FOR I=1 TO N: PRINT : PRINT "COL";I
20 FOR J=1 TO N: INPUT A(J,I),B(J,I): NEXT J
25 NEXT I
30 D1,I1=1: D2=0
35 I3=I1: S=ABS(A(I1,I1))+ABS(B(I1,I1))
40 FOR I=I1 TO N: T=ABS(A(I,I1))+ABS(B(I,I1))
45 IF S>=T THEN 50: I3=I: S=T
50 NEXT I: IF I3=I1 THEN 75
55 FOR J=1 TO N
60 S=-A(I1,J): A(I1,J)=A(I3,J): A(I3,J)=S
65 S1=-B(I1,J): B(I1,J)=B(I3,J): B(I3,J)=S1
70 NEXT J
75 I3=I1+1
80 FOR I=I3 TO N: S1=A(I1,I1)^2+B(I1,I1)^2
85 S=(A(I,I1)*A(I1,I1)+B(I,I1)*B(I1,I1))/S1
90 B(I,I1)=(A(I1,I1)*B(I,I1)-A(I,I1)*B(I1,I1))/S1
95 A(I,I1)=S: NEXT I
100 J2=I1-1: IF J2=0 THEN 150
110 FOR J=I3 TO N: FOR I=1 TO J2
120 A(I1,J)=A(I1,J)-A(I1,I)*A(I,J)+B(I1,I)*B(I,J)
130 B(I1,J)=B(I1,J)-B(I1,I)*A(I,J)-A(I1,I)*B(I,J)
140 NEXT I: NEXT J
150 J2=I1: I1=I1+1
160 FOR I=I1 TO N: FOR J=1 TO J2
170 A(I,I1)=A(I,I1)-A(I,J)*A(J,I1)+B(I,J)*B(J,I1)
180 B(I,I1)=B(I,I1)-B(I,J)*A(J,I1)-A(I,J)*B(J,I1)
190 NEXT J: NEXT I
200 IF I1<>N THEN 35: I3=1: J2=INT(N/2)
210 IF N=2*J2 THEN 230: I3=0
220 D1=A(N,N): D2=B(N,N)
230 FOR I=1 TO J2: J=N-I+I3
240 S=A(I,I)*A(J,J)-B(I,I)*B(J,J)
250 S1=A(I,I)*B(J,J)+A(J,J)*B(I,I)
260 T=D1*S-D2*S1: D2=D2*S+D1*S1: D1=T
270 NEXT I: PRINT
280 PRINT "DETERMINANT:";D1;"+I*";D2: PRINT
290 END
```

TITLE: HYPERBOLIC FUNCTIONS & INVERSE HYPERBOLICS

PROGRAM NO.: PS.02-2200.01A-00FI-21-0

TAPE NO.: 701-0119

BLOCK NO.: 21

```
5 SELECT R
10 PRINT "CODE,X? TO END PROGRAM INPUT 0,0."
20 INPUT N,X
25 IF N=0 THEN 240
30 IF N>3 THEN 140
40 S=(EXP(X)-EXP(-X))/2
50 C=(EXP(X)+EXP(-X))/2
60 IF N>1 THEN 90
70 PRINT "SINH(X)=";S
80 GOTO 210
90 IF N>2 THEN 120
100 PRINT "COSH(X)=";C
110 GOTO 210
120 PRINT "TANH(X)=";S/C
130 GOTO 210
140 IF N>4 THEN 170
150 PRINT "ARCSINH(X)=";LOG(X+SQR(X^2+1))
160 GOTO 210
170 IF N>5 THEN 200
180 PRINT "ARCCOSH(X)=";LOG(X+SQR(X^2-1))
190 GOTO 210
200 PRINT "ARCTANH(X)=";LOG((1+X)/(1-X))/2
210 PRINT
220 PRINT "CODE,X?"
230 GOTO 20
240 SELECT D :END
```

TITLE: SIN, COS, TAN, SINH, COSH, TANH-COMPLEX ARGUMENTS

ROGRAM NO.: PS.02-2200.01A-00FI-22-0

TAPE NO.: 701-0119

BLOCK NO.: 22

```
1 SELECT R
5 PRINT
10 PRINT "A,B? (TO END PROGRAM INPUT 0,0)"
15 INPUT A,B
16 PRINT
20 IF A^2+B^2=0 THEN 999
25 DEFFNS(W)=(EXP(W)-EXP(-W))/2
30 DEFFNC(W)=(EXP(W)+EXP(-W))/2
35 X=SIN(A)*FNC(B)
40 Y=COS(A)*FNS(B)
45 PRINT "SIN(A+BI)=";X;"+";Y;"I"
50 X=COS(A)*FNC(B)
55 Y=-SIN(A)*FNS(B)
60 PRINT "COS(A+BI)=";X;"+";Y;"I"
65 D=COS(2*A)+FNC(2*B)
70 X=SIN(2*A)/D
75 Y=FNS(2*B)/D
80 PRINT "TAN(A+BI)=";X;"+";Y;"I"
85 X=FNS(A)*COS(B)
90 Y=FNC(A)*SIN(B)
95 PRINT "SINH(A+BI)=";X;"+";Y;"I"
100 X=FNC(A)*COS(B)
110 Y=FNS(A)*SIN(B)
120 PRINT "COSH(A+BI)=";X;"+";Y;"I"
130 D=FNC(2*A)+COS(2*B)
140 X=FNS(2*A)/D
150 Y=SIN(2*B)/D
160 PRINT "TANH(A+BI)=";X;"+";Y;"I"
170 PRINT
180 PRINT
190 PRINT "A,B?"
200 GOTO 15
999 SELECT D :END
```

```
1 SELECT R
5 PRINT
10 PRINT "ANGLE? (TO END PROGRAM INPUT 99999)"
15 INPUT X
20 IF X=99999 THEN 99
25 A=3600*180*X/3.1415927
30 D=INT(A/3600)
35 D1=INT(D/360)
40 M=INT((A-D*3600)/60)
45 PRINT D-360*D1,"DEG."
50 PRINT M,"MIN."
55 PRINT A-D*3600-M*60,"SEC."
60 PRINT
65 PRINT "ANGLE?"
70 GOTO 15
99 SELECT D :END
```

```
5 SELECT R
10 PRINT
20 PRINT "ANGLE (DEG,MIN,SEC,CARRIAGE RETURN)?"
30 INPUT D,M,S
40 A=D+M/60+S/3600
50 R=INT(A/360)
60 PRINT "ANGLE=";A*.17453293E-1-R*6.2831853,"RADIANS"
70 PRINT
80 PRINT "MORE INPUT? (1=YES,0=NO)"
90 INPUT D
100 IF D=1 THEN 10
110 SELECT D :END
```

```
10 SELECT R
11 READ N,A1,B1
12 PRINT "INPUT X (TO END PROGRAM INPUT 99999)."
13 INPUT X
14 IF X=99999 THEN 999
15 LET S=SIN(X)
20 LET C=COS(X)
25 LET F=A1*S+B1*C
30 LET U=S
35 LET V=C
40 FOR I=2 TO N
45     LET S=S*V+C*U
50     LET C=C*V-S*U
55     READ A,B
60     LET F=F+A*S+B*C
65 NEXT I
70 PRINT "F(";X;")=";F
75 RESTORE
80 PRINT
85 PRINT "INPUT X"
90 GOTO 13
100DATA 3,1,1,-2,2,3,4
999 END
```

TITLE: PLANE TRIANGLE SOLUTION PROGRAM NO.: PS.02-2200.01A-00FI-26-0 TAPE NO.: 701-0119

BLOCK NO.: 26

```
5 SELECT R
10 DIM A(3),S(3)
39 PRINT "PROBLEM TYPES: 0=END PROGRAM,1=AAS,2=ASA,3=SSA,4=SAS,5
=SSS"
40 PRINT "INPUT PROBLEM TYPE"
50 INPUT Z
60 IF Z=0 THEN 999
70 IF Z=1 THEN 420
80 IF Z=2 THEN 390
90 IF Z=3 THEN 470
100 IF Z=4 THEN 350
300 PRINT "INPUT 'SIDE,SIDE,SIDE'"
305 INPUT S(1),S(2),S(3)
310 A(1)=(S(2)^2+S(3)^2-S(1)^2)/2/S(2)/S(3)
320 A(1)=ATN(SQR(1-A(1)^2)/A(1))
330 GOSUB 800
340 GOTO 40
350 PRINT "INPUT 'SIDE,ANGLE,SIDE'"
355 INPUT S(3),A(1),S(2)
360 S(1)=SQR(S(3)^2+S(2)^2-2*S(3)*S(2)*COS(A(1)))
370 GOSUB 800
380 GOTO 40
390 PRINT "INPUT 'ANGLE,SIDE,ANGLE'"
395 INPUT A(1),S(3),A(2)
400 A(3)=3.1415927-A(1)-A(2)
410 GOTO 440
420 PRINT "INPUT 'ANGLE,ANGLE,SIDE'"
425 INPUT A(3),A(2),S(3)
430 A(1)=3.1415927-A(2)-A(3)
440 S(1)=S(3)*SIN(A(1))/SIN(A(3))
450 S(2)=S(3)*SIN(A(2))/SIN(A(3))
460 GOSUB 825
465 GOTO 40
470 PRINT "INPUT 'SIDE,SIDE,ANGLE'"
475 INPUT S(1),S(2),A(1)
480 X=S(2)*SIN(A(1))
490 IF S(1)<X THEN 900
500 S(3)=SQR(S(2)^2-X^2)
502 IF S(1)>X THEN 510
504 GOSUB 800
506 GOTO 40
510 Z=SQR(S(1)^2-X^2)
530 S(3)=S(3)+Z
540 GOSUB 800
550 PRINT "ALTERNATE SOLUTION"
```

```
560 S(3)=S(3)-2*Z
565 A(3)=A(2)-A(1)
570 A(2)=3.1415927-A(2)
575 GOSUB 825
580 GOTO 40
800 A(2)=SIN(A(1))/S(1)*S(2)
810 A(2)=ATN(A(2)/SQR(1-A(2)^2))
820 A(3)=3.1415927-A(1)-A(2)
825 PRINT
830 FOR I=1 TO 3
835 IF A(I)<0 THEN 901
840 PRINT "SIDE";I;"=";S(I)
841 PRINT "OPPOSITE ANGLE=";A(I);"RADIANS"
850 NEXT I
860 PRINT
870 RETURN
900 PRINT
901 PRINT "NO SOLUTION"
902 PRINT
910 GOTO 40
999 SELECT D :END
```

TITLE: COORDINATE CHANGE PROGRAM NO.: PS.02-2200.01A-00FI-27-0 TAPE NO.: 701-0119

BLOCK NO.: 27

```
5 SELECT R
11 READ N
12 PRINT "X","Y","R","A"
15 IF N=-1 THEN 135
20 READ X,Y
25 IF X=0 THEN 45
30 IF Y=0 THEN 85
35 PRINT X,Y,SGN(X)*SQR(X^2+Y^2),ATN(Y/X)*180/3.1415927
40 GOTO 20
45 IF Y=0 THEN 75
47 PRINT X,Y,ABS(Y),
50 IF Y<0 THEN 65
55 PRINT 90
60 GOTO 20
65 PRINT 270
70 GOTO 20
75 PRINT X,Y,0,0
80 GOTO 20
85 PRINT X,Y,ABS(X),
90 IF X<1 THEN 120
100 PRINT 0
110 GOTO 20
120 PRINT 180
130 GOTO 20
135 READ R,A
136 LET Z=(A-INT(A/360)*360)*3.1415927/180
140 PRINT R*COS(Z),R*SIN(Z),R,A
150 GOTO 135
999 END
```

TITLE: AREA OF RECTILINEAR SURFACE PROGRAM NO.: PS.02-2200.01A-00FI-28-0 TAPE NO.: 701-0119

BLOCK NO.: 28

```
11 S=0
12 PRINT "N, X, Y"
15INPUT N, X0, Y0
16X=X0:Y=Y0
20FOR I=1TO N-1
22 PRINT "X"; I; ", Y"; I
25 INPUT X1, Y1
30      S=S+(X+X1)*(Y-Y1)
35      X=X1
40      Y=Y1
45 NEXT I
50 PRINT "A="; (S+(X+X0)*(Y+Y0))/2
55 PRINT "MORE INPUT (1=YES, 0=NO)"
60 INPUT I
65 IF I=1THEN 11
70 END
```

TITLE: LINEAR INTERPOLATION PROGRAM NO.: PS.02-2200.01A-00FI-29-0 TAPE NO.: 701-0119

BLOCK NO.: 29

```
5 PRINT "INPUT KNOWN POINTS (X1,Y1,X2,Y2,CARRIAGE RETURN)"
10 INPUT X1,Y1,X2,Y2
15 PRINT
20 PRINT "INPUT X-COORD. OF PT. TO BE INTERPOLATED. TO END "
25 PRINT "PROGRAM INPUT 99999."
30 INPUT X
35 IF X=99999 THEN 99
40 PRINT "Y=";Y1+(Y2-Y1)/(X2-X1)*(X-X1)
45 PRINT
50 PRINT "X";
55 GOTO 30
99 END
```

TITLE: LAGRANGIAN INTERPOLATION PROGRAM NO.: PS.02-2200.01A-00FI-30-0 TAPE NO.: 701-0119

BLOCK NO.: 30

```
3 DIM X(70),Y(70)
5 PRINT "INPUT NUMBER OF KNOWN POINTS, N"
10 INPUT N
15 PRINT "INPUT KNOWN POINTS (1 POINT TO A LINE) AS FOLLOWS: (X,
Y)"
20 FOR I=1 TO N
25 INPUT X(I),Y(I)
30 NEXT I
35 PRINT "INPUT X-COORDINATE OF POINT TO BE INTERPOLATED. TO END
"
36 PRINT "KEY 99999"
47 PRINT
60 PRINT "X";
65 INPUT Z
67 IF Z=99999THEN 160
70 T=0
75 FOR K=1 TO N
80 S=1
85 FOR I=1 TO N
90 IF I=K THEN 100
95 S=S*(Z-X(I))/(X(K)-X(I))
100 NEXT I
110 T=T+S*Y(K)
120 NEXT K
130 PRINT "Y=";T
140 PRINT
150 GOTO 60
160 END
```

TITLE: GREATEST COMMON DIVISOR PROGRAM NO.: PS.02-2200.01A-00FI-31-0 TAPE NO.: 701-0119

BLOCK NO.: 31

```
5 PRINT "***GREATEST COMMON DIVISOR OF TWO INTEGERS***"
10 PRINT
100 PRINT "INPUT 'INTEGER, INTEGER'.   TO END PROGRAM INPUT '0,0'"

110 INPUT A,B
115 IF A=0 THEN 999
120 PRINT
130 C=ABS(A)
140 D=ABS(B)
150 R=C-D*INT(C/D)
160 IF R=0 THEN 200
170 C=D
180 D=R
190 GOTO 150
200 PRINT "G. C. D. =";D
210 PRINT
220 PRINT "INPUT 'INTEGER, INTEGER'"
230 GOTO 110
999END
```

TITLE: PRIME FACTORIZATION OF AN INTEGER

PROGRAM NO.: PS.02-2200.01A-00FI-32-0

TAPE NO.: 701-0119

BLOCK NO.: 32

```
100 PRINT "INPUT NUMBER TO BE FACTORED.   TO END PROGRAM INPUT 0"

110 INPUT N
115 IF N=0 THEN 260
120 PRINT
130 PRINT "FACTORS"
135 PRINT SGN(N)
136 N=ABS(N)
140 FOR I=2 TO N
150     S=0
160     IF N/I<>INT(N/I) THEN 200
170     N=N/I
180     S=S+1
190 GOTO 160
200     IF S=0 THEN 220
210 PRINT I;"^";S
220 NEXT I
230 PRINT
240 PRINT "NUMBER";
250 GOTO 110
260 END
```

TITLE: PERMUTATIONS AND COMBINATIONS

PROGRAM NO.: PS.02-2200.01A-00FI-33-0

TAPE NO.: 701-0119

BLOCK NO.: 33

```
5 PRINT "INPUT 'N,R'.  TO END PROGRAM INPUT VALUES<=0."
7 GOTO 20
10 PRINT "INPUT 'N,R'"
20 INPUT N,R
30 IF N<=0 THEN 999
40 IF R<=0 THEN 999
50 IF R<=N THEN 90
60 PRINT "R MUST BE <=N"
70 PRINT
80 GOTO 10
90 P=1
100 FOR L=N-R+1 TO N
110 IF 9.9E62/L>=P THEN 150
120 PRINT "NO.  OF PERMUTATIONS CANNOT BE COMPUTED DUE TO FLOATIN
G"
130 PRINT "POINT OVERFLOW"
135 PRINT
140 GOTO 10
150 P=P*L
160 NEXT L
170 F=1
175 IF R=1 THEN 210
180 FOR I=2 TO R
190 F=F*I
200 NEXT I
210 PRINT "NO.  OF PERMUTATIONS IS ";P
220 PRINT "NO.  OF COMBINATIONS IS ";P/F
230 PRINT
240 GOTO 10
999 END
```

TITLE: LOG B TO BASE A PROGRAM NO.: PS.02-2200.01A-00FI-34.0 TAPE NO.: 701-011?

BLOCK NO.: 34

```
10 PRINT "INPUT A,B.  TO END PROGRAM INPUT 0,0."
20 INPUT A,B
25 IF A=0 THEN 70
30 PRINT "LOG";B;"TO BASE";A;"=";LOG(B)/LOG(A)
40 PRINT
50 PRINT "INPUT A,B"
60 GOTO 20
70 END
```

TITLE: SECOND DEGREE EQUATION I PROGRAM NO.: PS.02-2200.01A-00FI-35-0 TAPE NO.: 701-0119

BLOCK NO.: 35

```
5 PRINT "INPUT P, Q, R, S, T"
10 INPUT P, Q, R, S, T
15 PRINT "A="; P^2-R
20 PRINT "B="; -2*P
25 PRINT "C="; 1
30 PRINT "D="; 2*P*Q-S
35 PRINT "E="; -2*Q
40 PRINT "F="; Q^2-T
45 PRINT
50 PRINT "MORE INPUT? (1=YES, 0=NO)"
55 INPUT P
60 PRINT
65IF P=1 THEN 5
70 END
```

TITLE: EXPLICIT SECOND DEGREE EQUATION

PROGRAM NO.: PS.02-2200.01A-00FI-36-0

TAPE NO.: 701-0119

BLOCK NO.: 36

```
5 PRINT
10 PRINT "ENTER P, Q, R, S, T"
15 INPUT P, Q, R, S, T
20 A=P^2-R
25 D=2*P*Q-S
30 PRINT "P1=";P/A
35 PRINT "Q1=";-D/2/A
40 PRINT "R1=";(P/A)^2-1/A
45 PRINT "S1=";-D*P/(A^2)+2*Q/A
50 PRINT "T1=";(D/2/A)^2-(Q^2-T)/A
55 PRINT
60 PRINT "MORE INPUT? (1=YES, 0=NO)"
65 INPUT P
70 IF P=1 THEN 5
75 END
```

TITLE: SECOND DEGREE EQUATION II PROGRAM NO.: PS.02-2200.01A-00FI-37-0 TAPE NO.: 701-0119

BLOCK NO.: 37

```
5 PRINT "ENTER A, B, C, D, E, F"
10 INPUT A, B, C, D, E, F
15 PRINT "P="; -B/A/2
20 PRINT "Q="; -D/A/2
25 PRINT "R="; (B/A/2)^2-C/A
30 PRINT "S="; (B*D/2-E)/A
35 PRINT "T="; (D/A/2)^2-F/A
40 PRINT
45 PRINT "MORE INPUT? (1=YES, 0=NO)"
50 INPUT A
55 PRINT
60 IF A=1 THEN 5
65 END
```

TITLE: ALGEBRA OF COMPLEX NUMBERS

PROGRAM NO.: PS.02-2200.01A-00FI-33-0

TAPE NO.: 701-0110

BLOCK NO.: 33

```
11 READ N, X, Y
15 FOR I=1 TO N-1
20 READ M, V, W
22 A=X
25 IF M=2 THEN 200
30 IF M=3 THEN 300
35 IF M=4 THEN 400
100 X=X+V
110 Y=Y+W
120 GOTO 500
200 X=X-V
210 Y=Y-W
220 GOTO 500
300 X=X*V-Y*W
310 Y=A*W+V*Y
320 GOTO 500
400 X=(X*V+Y*W)/(V^2+W^2)
410 Y=(V*Y-A*W)/(V^2+W^2)
500 NEXT I
510 PRINT X, Y; "I"
999END
```

TITLE: HYPERGEOMETRIC FUNCTION PROGRAM NO.: PS.02-2200.01A-00FI-39-0 TAPE NO.: 701-0119

BLOCK NO.: 39

```
5 PRINT "A,B,Z,N? (TO END PROGRAM INPUT 0,0,0,0)"
10 INPUT A,B,Z,N
15 IF A^2+B^2=0 THEN 99
20 S=1
25 FOR I=N TO 1 STEP -1
30 S=1+(A+I-1)*Z*S/((B+I-1)*I)
35 NEXT I
40 PRINT "M=";S
45 PRINT
50 PRINT "A,B,Z,N?"
55 GOTO 10
99 END
```

TITLE: SQUARE ROOT OF A COMPLEX NUMBER

PROGRAM NO.: PS.02-2200.01A-00FI-40-0

TAPE NO.: 701-0110

BLOCK NO.: 40

```
5 PRINT
7 PRINT "INPUT COMPLEX NO.  (A,B,CARRIAGE RETURN)"
10 INPUT A,B
15 IF B<0 THEN 50
20 IF B>0 THEN 50
25 IF A<0 THEN 40
30 PRINT "ANS. : ";SQR(A)
35 GOTO 5
40 PRINT "ANS. : ";SQR(-A);"I"
45 GOTO 5
50 R=SQR(A^2+B^2)
55 PRINT "ANS. : ";SQR((A+R)/2),SGN(B)*SQR((R-A)/2);"I"
60 GOTO 5
65 END
```

TITLE: BESSEL FUNCTION PROGRAM NO.: PS.02-2200.01A-00FI-41-0 TAPE NO.: 701-0119

BLOCK NO.: 41

```
10 PRINT "INPUT I,X  TO END PROGRAM INPUT 0,0"
20 INPUT I,X
25 IF I=0 THEN 190
30 X1=(X/2)^2
40 S,J,T,L=1
50 K=-1
70 T=T*X1/J/(I+J)
80 S=S+K*T
90 IF T<1E-6 THEN 130
100 K=-K
110 J=J+1
120 GOTO 70
130 FOR K=1 TO I
140 L=L*K
150 NEXT K
160 PRINT "ANS. :";(X/2)^I/L*S
170 PRINT
180 PRINT "INPUT I,X"
185 GOTO 20
190 END
```

TITLE: GAMMA FUNTION PROGRAM NO.: PS.02-2200.01A-00FI-42-0 TAPE NO.: 701-0119

BLOCK NO.: 42

```
10 PRINT "INPUT X.  TO END PROGRAM INPUT 0. "
20 INPUT X
30 IF X=0 THEN 999
40 IF INT(X)/ABS(X)<>-1 THEN 70
50 PRINT "GAMMA(X) UNDEFINED"
60 GOTO 910
70 IF X<2 THEN 200
100 P=INT(X)-1
110 X=X-P
120 GOSUB 500
130 GOSUB 600
140 X=S*T
150 GOTO 900
200 IF X<1 THEN 300
210 GOSUB 600
220 X=T
230 GOTO 900
300 IF X<0 THEN 400
310 Y=X
320 X=X+1
330 GOSUB 600
340 X=T/Y
350 GOTO 900
400 P=ABS(INT(X))+1
410 GOSUB 500
420 X=X+P
430 Y=X
440 X=X+1
450 GOSUB 600
460 X=T/Y/S
470 GOTO 900
500 S=1
510 FOR I=0 TO P-1
520 S=S*(X+I)
530 NEXT I
540 RETURN
600 T,W=1
610 X=X-1
620 FOR I=1 TO 8
630 W=W*X
640 READ B
650 T=T+W*B
660 NEXT I
670 RETURN
680 DATA -.57719165,.98820589,-.89705694
690 DATA .91820686,-.75670408,.48219939
700 DATA -.19352782,.03586834
900 PRINT "GAMMA(X)=";X
910 PRINT
920 PRINT "X";
930 RESTORE
940 GOTO 20
999 END
```

TITLE: FOURIER ANALYSIS PROGRAM NO.: PS.02-2200.01A-00FI-43-0 TAPE NO.: 701-0119

(DEFINED FUNCTION) BLOCK NO.: 43

```
5 N=35
10 DIM Y(71),A(35),B(35)
15 FOR I=1 TO 2*N+1: Y(I)=FNC((I-1)*.88495568E-1): NEXT I
20 PRINT "INPUT MAXIMUM HARMONIC TO BE CALCULATED (<N)";:INPUT M
25 PRINT : PRINT "HARMONIC","COSINE COEFF.","SINE COEFF."
30 C3=2/(2*N+1): K1=3.1415927*C3
35 S1=SIN(K1): C1=COS(K1)
40 J,C=1: S=0: W=Y(1)
45 U1,U2=0: I=2*N+1
50 U3=Y(I)+2*C*U1-U2: U2=U1: U1=U3
55 I=I-1: IF I>1 THEN 50
60 A(J)=C3*(W+C*U1-U2): IF J<>1 THEN 70
65 A(1)=A(1)*.5
70 B(J)=C3*S*U1: PRINT J-1,A(J),B(J)
75 IF J>=M+1 THEN 90
80 Q=C1*C-S1*S: S=C1*S+S1*C: C=Q
85 J=J+1: GOTO 45
90 PRINT
95 PRINT "INPUT X-VALUE TO BE EVALUATED. TO END PROGRAM INPUT 99
999"
100 INPUT W: IF W=99999 THEN 999
110 I=0
120 FOR J=1 TO M+1: I=I+A(J)*COS((J-1)*W)+B(J)*SIN((J-1)*W): NEX
T J
130 PRINT "Y=";I: PRINT :PRINT :PRINT "X";: GOTO 100
999 END
```

TITLE: FOURIER ANALYSIS (TABULATED FUNCTION)

PROGRAM NO.: PS.02-2200.01A-00FI-44-0

TAPE NO.: 701-0119

BLOCK NO.: 44

```
10 DIM Y(32),A(15),B(15)
15 PRINT "INPUT N": INPUT N
20 PRINT "INPUT VALUES OF FUNCTION (4/LINE)"
25 FOR I=0 TO INT((N+2)/2)-1
30 INPUT Y(4*I+1),Y(4*I+2),Y(4*I+3),Y(4*I+4): NEXT I
35 PRINT "INPUT MAXIMUM HARMONIC TO BE CALCULATED (<=N)": INPUT
M
40 PRINT : PRINT "HARMONIC          COSINE COEFF.   SINE COEFF."
45 C3=2/(2*N+1): K1=3.1415927*C3
50 S1=SIN(K1): C1=COS(K1)
55 J,C=1: S=0: W=Y(1)
60 U1,U2=0: I=2*N+1
65 U3=Y(I)+2*C*U1-U2: U2=U1: U1=U3
70 I=I-1: IF I>1 THEN 65
75 A(J)=C3*(W+C*U1-U2): IF J<>1 THEN 85
80 A(1)=A(1)*.5
85 B(J)=C3*S*U1: PRINT J-1,A(J),B(J)
87 IF J>=M+1 THEN 100
90 Q=C1*C-S1*S: S=C1*S+S1*C: C=Q
95 J=J+1: GOTO 60
100 PRINT
110 PRINT "INPUT X-VALUE TO BE EVALUATED.  TO END PROGRAM INPUT 9
9999"
120 INPUT W: IF W=99999 THEN 999
130 I=0
140 FOR J=1 TO M+1: I=I+A(J)*COS((J-1)*W)+B(J)*SIN((J-1)*W):NEXT
J
150 PRINT "Y=";I: PRINT : PRINT "INPUT X": GOTO 120
999 END
```

Jack Jarvis & Company, Inc.
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WANG LABORATORIES, INC.
836 NORTH STREET, TEWKSBURY, MASSACHUSETTS 01876, TEL (617) 851-4111, TWX 710 343-6769, TELEX 94-7421

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