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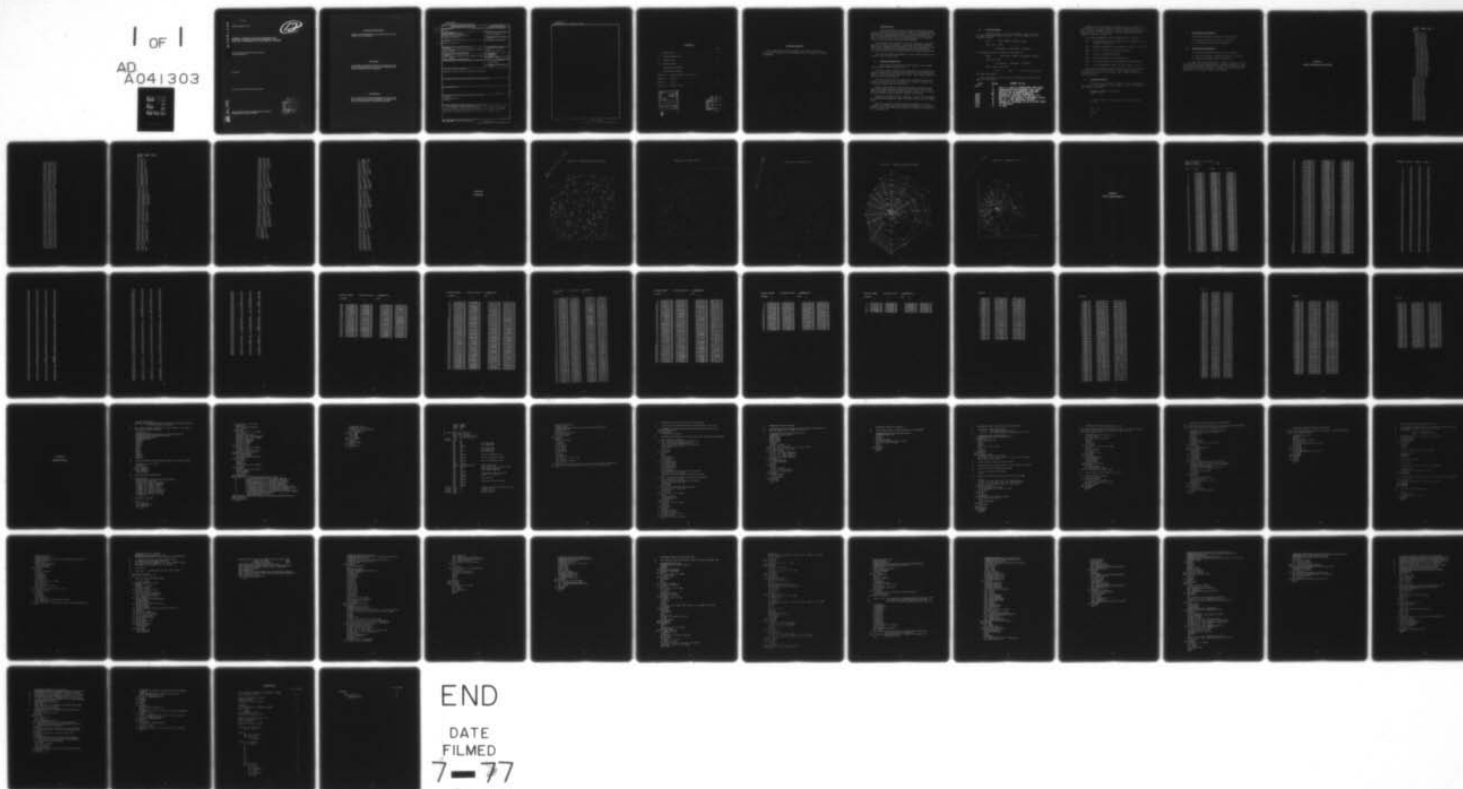
ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND REDSTO--ETC F/6 9/2
GENERAL CONTOUR PLOTTING PROGRAM FOR HOUSTON INSTRUMENTS OR TEK--ETC(U)
APR 77 G E PATRICK

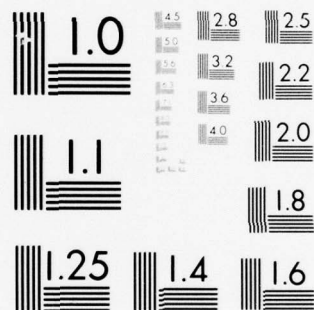
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Technical Report TL-77-5

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GENERAL CONTOUR PLOTTING PROGRAM FOR
HOUSTON INSTRUMENTS OR TEKTRONIX PLOTTERS

Ground Equipment and Missile Structures Directorate
Technology Laboratory

April 1977

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER TL-77-5	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) GENERAL CONTOUR PLOTTING PROGRAM FOR HOUSTON INSTRUMENTS OR TEKTRONIX PLOTTERS		5. TYPE OF REPORT & PERIOD COVERED Technical Report
7. AUTHOR(s) Grady E. Patrick, Jr.		6. PERFORMING ORG. REPORT NUMBER TL-77-5
9. PERFORMING ORGANIZATION NAME AND ADDRESS Commander US Army Missile Research and Development Command Attn: DRDMI-TL Redstone Arsenal, Alabama 35809		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Commander US Army Missile Research and Development Command Attn: DRDMI-TI Redstone Arsenal, Alabama 35809		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DA N/A AMCMS 2200.13.DC01.7.X1
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE April 1977
		13. NUMBER OF PAGES 67
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Contours Triangular patterns Spline fit		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A generalized computer program has been developed to plot contours on the Houston Instruments and/or Tektronix plotters. Several input options are permitted to increase flexibility of the program. The program is programmed in FORTRAN IV language and implemented on the CDC 6600 computer.		

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ACKNOWLEDGMENTS

Mr. Richard Eppes, Ground Equipment and Missile Structures Directorate, is gratefully acknowledged for his assistance in program development.

I. INTRODUCTION

Several programs have been developed for plotting contours on different types of plotting devices. Most of the programs require ordered arrays or other restrictions on the data being processed. The data for this program have the restriction that the elevation above the x-y plane not be the same as surrounding points; i.e., several points in an area should not be the same elevation.

The program either develops or reads, as input data, triangular patterns from nodal values input. From these triangular elements, each side is investigated to determine if one of the desired contours fall in this element. When all elements have been investigated, the contours are ordered and spline-filled for a smooth curve output.

Note that the density or sparsity of nodal points determines the accuracy of the contour plots.

II. PROGRAM DESCRIPTION

The program is developed in three overlays. Each overlay uses a dynamic core allocation scheme.

The (0,0) overlay determines user preferences as to plotter type, number of points used in spline-fitting spacing of contour labeling, number of contours desired, and their values. This overlay remains in core during the entire process.

The (1,0) overlay reads the input nodal values and their corresponding elevation and, if not specified by the user, generates the triangular elements from the nodal data.

Overlay (2,0) locates the desired contours as specified in the main overlay and orders these contours for plotting. This routine produces an output of nodal points, elements, and contours in addition to tape 7 which is used in the next overlay for plotting.

Overlay (3,0) reads the data from tape 7, spline fits the data to four times as many points as input, then plots the data on the desired device.

When the triangular elements have been developed, it is only necessary to implement the proper overlay for additional or different contour output. The output on the Houston Instruments is plotted on a 20- x 20-inch plot.

III. PROGRAM USAGE

Input data may be of one or two forms. If the user does not supply triangular elements as input, the input format is in free format as follows:

CARD 1 JMAX, (Number of nodes in plot)

CARD 2 thru JMAX

X coordinate, Y coordinate, Z elevation

If a triangular pattern is included, the format is:

CARD 1 JMAX, NELM, (Number of triangular elements)

CARD 2 thru JMAX

X coordinate, Y coordinate, Z elevation

CARD 3 JMAX +2 thru NELM

Node 1 Node 2 Node 3, of each element

The input is on Tape 1.

When the program begins execution, the following information will appear on the screen:

NAME	VALUE	FORMAT A4,I2
IFLO	1	
	1	ONLY X,Y AND Z COORDINATES ARE INPUT
	2	COORDINATES AND ELEMENTS ARE INPUT
	3	REPLOTTING OF GENERATED CONTOURS
INUM	20	SPACING OF CONTOUR NUMBERING
IPTS	4	SMOOTHING FUNCTION FOR SPLINE FIT
IHIP	0	SET TO 1 FOR HOUSTON INSTRUMENT PLOTS
ITEK	0	SET TO 1 FOR TEKTRONIX OUTPUT
NCON	0	NUMBER OF CONTOURS TO BE PLOTTED 20MAX
CONT	0	TO CONTINUE
END	0	TO END

Regardless of the input used, IFLO must be set to 1, default until a successful run has been completed. After a successful run (i.e., tape 7 has been generated), IFLO set to 2 may be used to generate additional contours. If IFLO is minus, no contour nodes will be plotted (Appendix B, Figures B-2 and B-3).

The following parameters may be changed with each execution:

INUM	Factor which controls the spacing of the numbering of the contours - default 20.
IPTS	Smoothing parameter for the spline-fit routine - default 4.
IHIP	Set to 1 for Houston Instruments' plots.
ITEK	Set to 1 for Tektronix plots.
NCON	Set to the number of contours desired.
CONT	To continue after all other parameters have been set.
END	To end program execution, the input format is A4,I2.

When the desired parameters have been entered and CONT is entered, the program will ask for NCON contours to be entered. These are floating point numbers in free format. Tape 6 contains all of the generated output.

IV. PROGRAM CHANGES

One subroutine is written in compass. This routine returns the amount of core available to the program. This may be replaced by the following subroutine:

```
SUBROUTINE KOREFL (A, KORE, KFL)
DIMENSION A(1)

C

C SET KORE equal to or greater than 35 times the number
  of nodes

C

KORE = XXX

RETURN

END
```

V. **HARDWARE REQUIREMENTS**

The following hardware requirements are necessary:

- a) Houston Instruments' plotter or equivalent.
- b) Tektronix 401X terminal or equivalent.

VI. **SOFTWARE REQUIREMENTS**

The following software requirements are necessary:

- a) Houston Instruments' plotting package or equivalent.
- b) Tektronix Terminal Control System (TCS).

Two sample problems are presented. Appendix A presents a list of the input data for each sample problem. Appendix B shows the output obtained on the Houston Instruments' plotter for each example. Appendix C presents a list of the output obtained for the first example. Appendix D is the FORTRAN listing of the program.

Appendix A.
SAMPLE PROBLEMS INPUT LISTINGS

INPUT DATA SET I

105 0

8.5	.5	3.4
17.4	.4	4.7
11.8	1.2	4.1
9.6	2.6	3.0
16.3	3.1	4.6
17.	3.7	4.7
7.9	4.0	2.7
12.2	4.9	3.9
12.6	7.4	4.2
7.3	8.2	3.5
2.5	8.5	3.4
5.1	11.4	4.3
1.8	11.8	4.8
16.7	12.	5.7
18.	13.6	5.8
15.5	13.4	5.9
6.2	16.8	5.2
3.8	17.9	5.5
13.5	18.	5.9
2.2	19.4	4.9
9.0	20.	5.8
17.5	19.5	5.9
6.7	21.1	6.1
2.0	23.2	4.6
3.2	22.9	4.9
4.5	23.4	5.0
9.7	24.4	4.4
24.4	1.4	5.
29.2	1.7	4.1
32.4	0.1	3.3
29.0	3.3	4.0
38.3	1.8	2.2
41.8	2.5	2.8
21.4	6.5	4.9
31.3	5.0	3.3
36.1	4.7	2.7
41.1	5.3	3.3
43.2	5.5	3.8
49.4	3.8	2.8
33.4	7.6	3.3
22.2	10.7	4.9
27.1	10.3	4.2
31.8	9.8	3.5
43.3	8.5	4.1
31.1	12.2	4.3
30.8	13.8	4.5
31.8	14.0	4.7
29.8	15.5	4.8
23.1	16.0	5.1
34.9	12.7	4.5
41.4	12.8	5.0
43.3	15.4	5.8
34.0	17.5	5.8

37.9	18.3	6.4
39.1	18.0	6.3
33.7	19.8	6.7
39.5	20.5	6.7
30.2	21.4	6.8
37.5	22.0	6.8
42.5	22.3	6.8
23.8	22.3	6.0
22.3	26.1	6.8
24.9	26.3	7.0
42.0	25.4	6.7
48.5	25.1	5.4
10.3	25.6	4.8
8.7	27.0	4.5
4.3	27.2	4.0
2.1	29.7	3.3
14.2	29.0	5.1
19.7	28.4	6.5
33.0	28.5	7.9
29.6	30.5	7.7
25.6	30.7	8.1
48.2	30.8	4.9
44.1	31.3	5.3
46.9	32.9	4.7
45.3	33.1	4.7
39.5	32.5	5.8
13.8	34.5	5.0
10.8	35.8	5.1
19.2	36.0	6.5
20.3	36.9	6.4
27.8	36.3	6.5
40.9	36.6	4.4
47.9	36.4	4.0
1.1	39.4	3.9
13.2	39.3	5.6
33.0	38.5	5.5
18.8	42.1	5.4
35.3	40.6	4.9
36.3	41.7	4.5
43.7	41.1	3.5
28.8	42.2	5.2
32.3	42.8	4.8
15.1	44.6	4.9
14.0	45.9	4.6
18.3	47.4	4.2
15.3	48.3	4.1
18.6	46.0	4.6
24.0	48.5	3.9
32.4	48.5	3.6
38.4	45.6	3.6
41.5	47.0	2.9
47.0	47.5	2.7

INPUT DATA SET 2

157 0
0. 0. 4.
0. 10. 5.
0. 20. 6.
0. 30. 7.
0. 40. 8.
0. 50. 9.
0. 60. 10.
0. 70. 11.
0. 80. 12.
0. 90. 13.
0. 100. 14.
0. 120. 15.
0. 130. 16.
0. 150. 17.
0. 180. 18.
0. 200. 19.
-3. 11. 5.
-14. 37. 6.
-17. 41. 7.
-21. 65. 8.
-27. 84. 9.
-30. 93. 10.
-33. 102. 11.
-36. 112. 13.
-39. 121. 15.
-42. 131. 17.
-46. 140. 18.
-53. 158. 19.
-6. 9. 5.
-24. 33. 6.
-30. 41. 7.
-36. 48. 8.
-42. 57. 10.
-48. 65. 12.
-54. 73. 14.
-60. 81. 16.
-66. 89. 18.
-78. 105. 19.
-8. 7. 5.
-16. 13. 6.
-32. 26. 7.
-40. 32. 8.
-48. 37. 10.
-56. 44. 11.
-64. 51. 13.
-72. 57. 14.
-80. 64. 16.
-88. 69. 17.
-96. 76. 18.
-104. 81. 19.
-9. 4. 5.
-18. 7. 6.
-37. 14. 7.
-46. 18. 8.
-55. 21. 10.

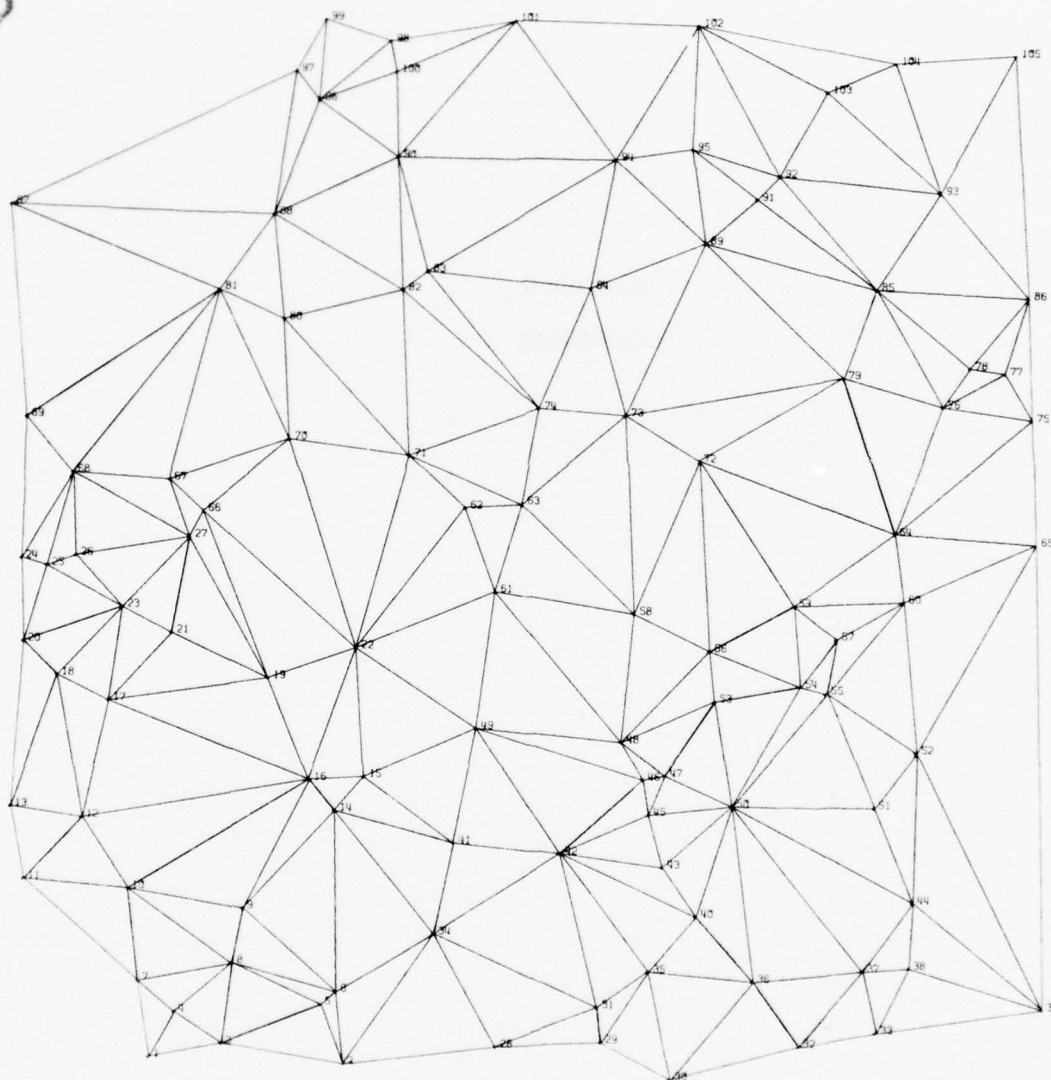
-65. 24. 12.
 -74. 27. 14.
 -83. 30. 16.
 -93. 34. 17.
 -102. 38. 18.
 -110. 41. 19.
 -10. -1. 5.
 -29. -3. 6.
 -39. -4. 7.
 -49. -5. 8.
 -58. -6. 9.
 -68. -7. 10.
 -78. -8. 11.
 -87. -9. 12.
 -96. -10. 13.
 -106. -11. 15.
 -116. -12. 18.
 -125. -13. 19.
 -9. -4. 5.
 -27. -12. 6.
 -45. -20. 7.
 -54. -24. 8.
 -63. -28. 9.
 -72. -32. 10.
 -81. -36. 11.
 -90. -38. 14.
 -100. -42. 16.
 -109. -44. 19.
 -6. -8. 5.
 -36. -48. 6.
 -42. -56. 7.
 -48. -64. 8.
 -54. -72. 10.
 -60. -80. 11.
 -66. -88. 12.
 -72. -96. 14.
 -78. -104. 15.
 -84. -112. 16.
 -90. -120. 17.
 -96. -128. 18.
 -102. -136. 19.
 0. -10. 5.
 0. -30. 6.
 0. -60. 7.
 0. -90. 8.
 0. -130. 9.
 0. -150. 10.
 0. -170. 11.

0. -180. 12.
 0. -190. 13.
 4. -9. 5.
 8. -18. 7.
 12. -27. 8.
 21. -46. 9.
 58. -126. 10.
 67. -144. 11.
 79. -171. 12.
 10. -3. 5.
 19. -6. 7.
 28. -9. 8.
 37. -12. 9.
 67. -21. 10.
 117. -36. 11.
 136. -42. 12.
 165. -51. 13.
 183. -57. 14.
 10. .7 5.
 20. 1.5 6.
 30. 2.2 8.
 50. 3.7 9.
 70. 5.2 10.
 100. 7.5 11.
 110. 8.4 12.
 120. 9.1 13.
 130. 10. 17.
 160. 12.1 18.
 180. 13.5 19.
 9. 5. 5.
 26. 15. 7.
 35. 20. 8.
 44. 25. 9.
 53. 30. 10.
 62. 35. 11.
 70. 40. 12.
 80. 45. 13.
 97. 55. 15.
 105. 60. 17.
 139. 80. 18.
 173. 100. 19.
 5. 9. 5.
 13. 27. 6.
 18. 36. 7.
 23. 45. 8.
 27. 54. 10.
 32. 63. 11.
 40. 81. 12.
 44. 90. 13.
 49. 99. 15.
 53. 108. 16.
 58. 117. 17.
 66. 135. 18.
 80. 162. 19.

Appendix B.
CONTOURS

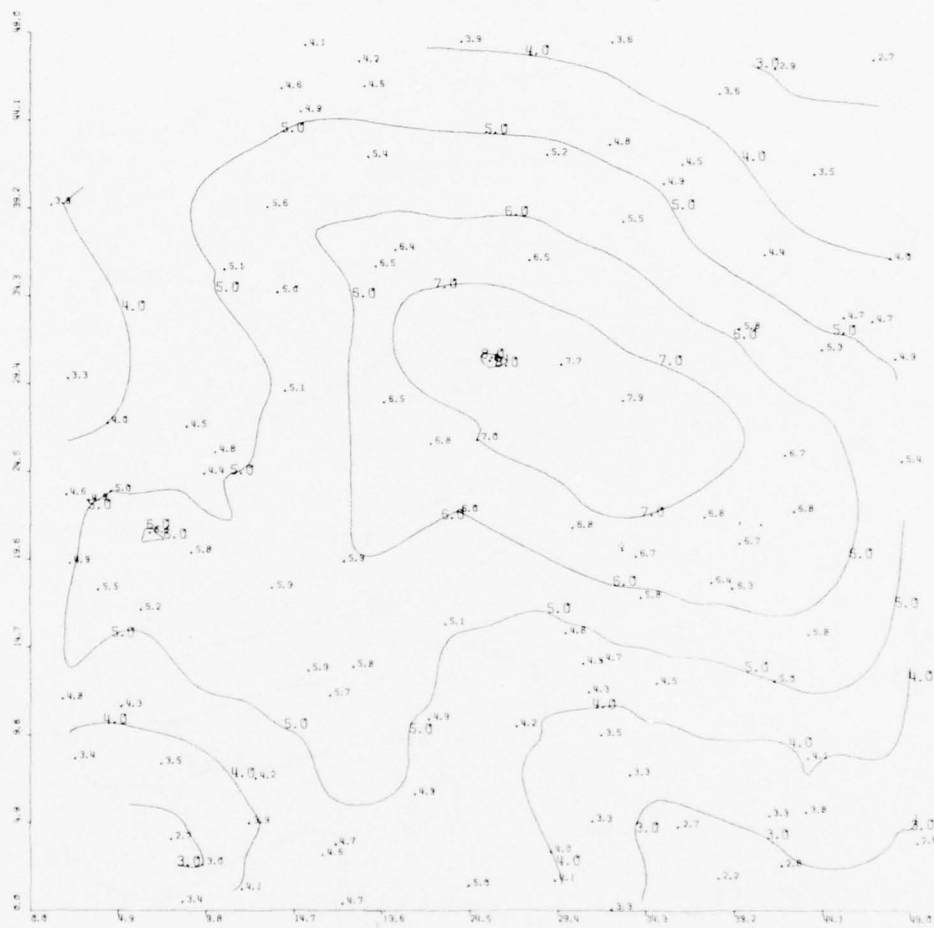
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DATA SET 1 - GENERATED TRIANGULAR PATTERN



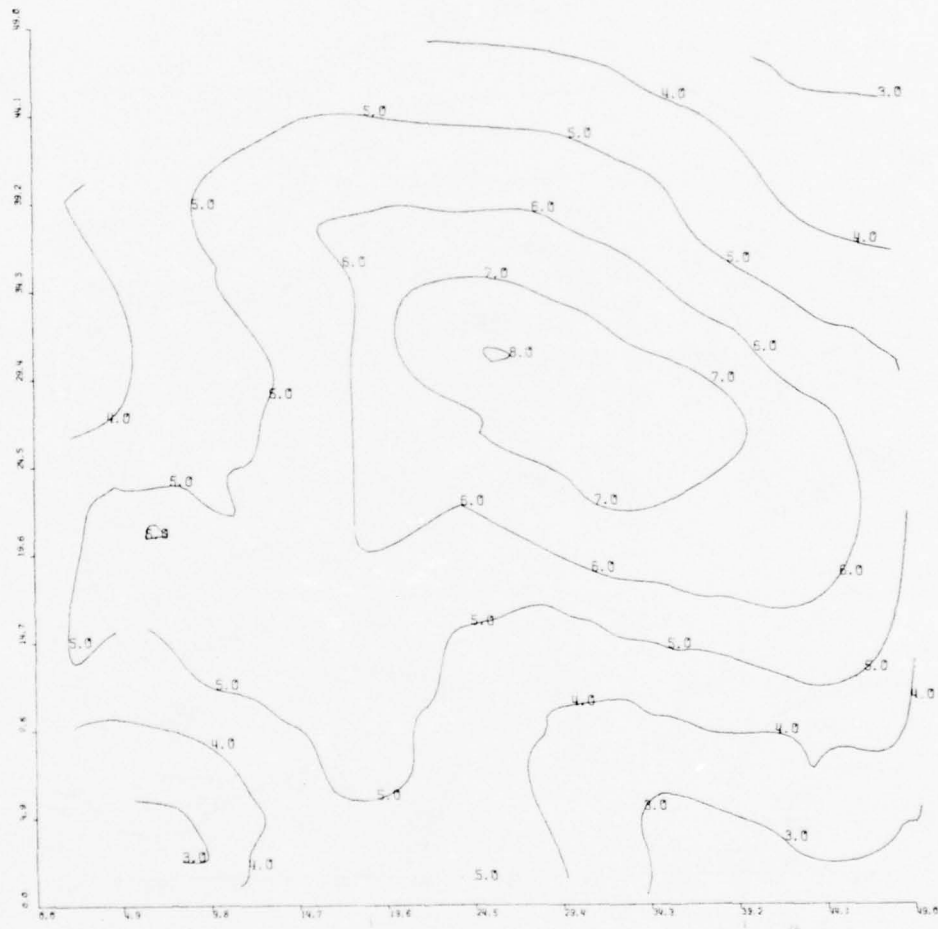
DATA SET 1 - CONTOUR IFLO = +1

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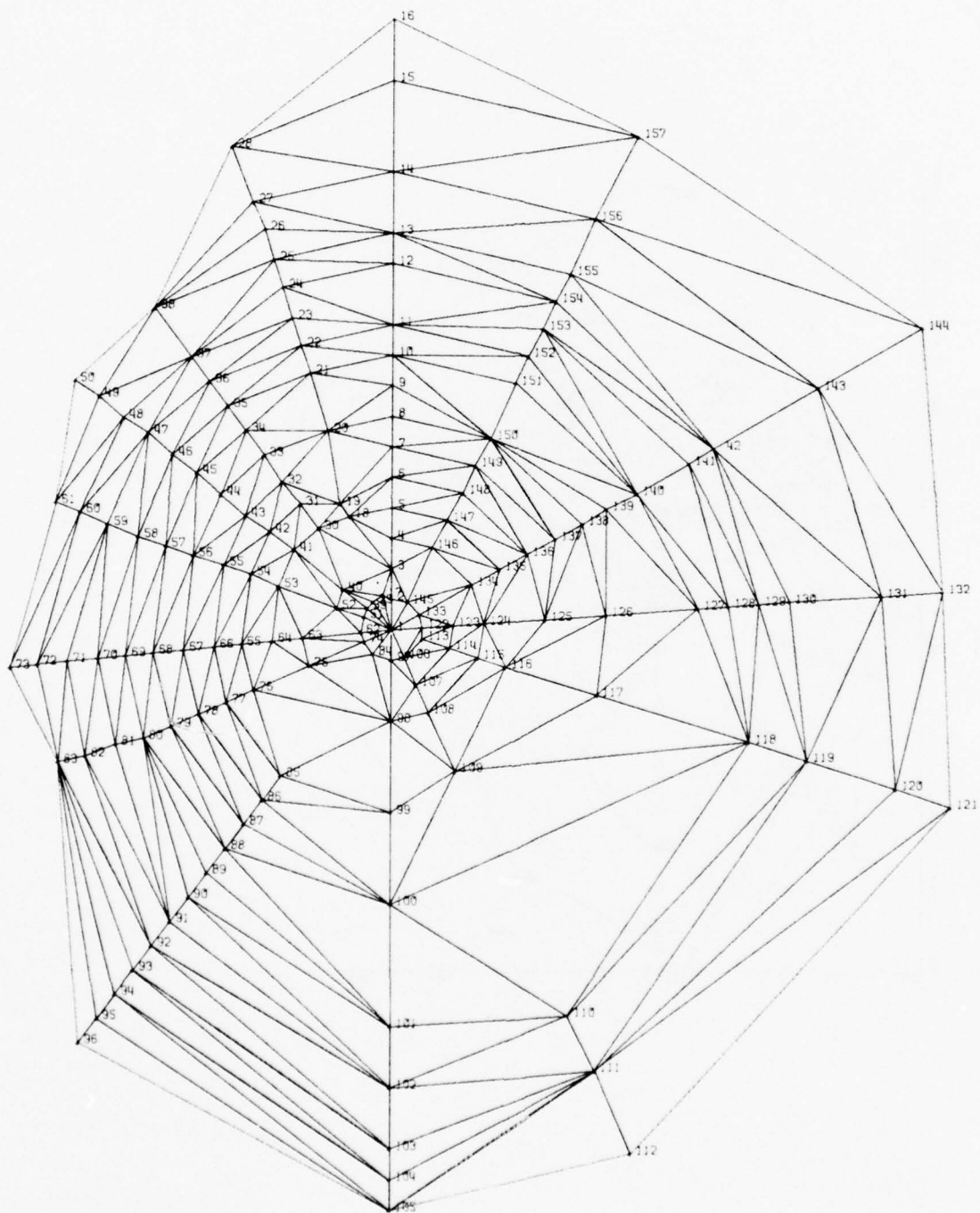


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DATA SET 1 - CONTOUR IFLO = -1

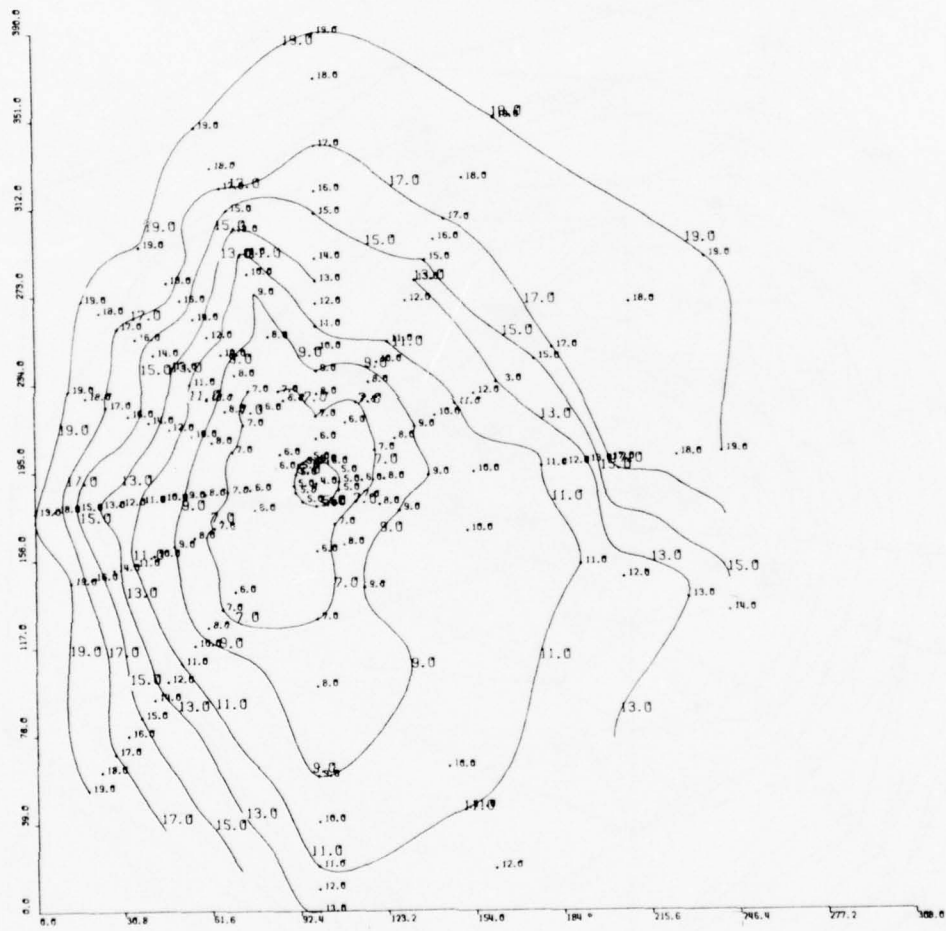


DATA SET 2 - GENERATED TRIANGULAR PATTERN



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DATA SET 2 - CONTOUR IFLO = +1



Appendix C.
OUTPUT FROM EXAMPLE 1

NUMBER OF CONTOURS TO BE PLOTTED = 6
 NUMBER OF NODES = 105
 NUMBER OF ELEMENTS = 182

NODE	X-COORD	Y-COORD	VALUE
1	.850000E+01	.500000E+00	.340000E+01
2	.174000E+02	.400000E+00	.470000E+01
3	.118000E+02	.120000E+01	.410000E+01
4	.960000E+01	.260000E+01	.300000E+01
5	.163000E+02	.310000E+01	.460000E+01
6	.170000E+02	.370000E+01	.470000E+01
7	.790000E+01	.400000E+01	.270000E+01
8	.122000E+02	.490000E+01	.390000E+01
9	.126000E+02	.740000E+01	.420000E+01
10	.730000E+01	.820000E+01	.350000E+01
11	.250000E+01	.850000E+01	.340000E+01
12	.510000E+01	.114000E+02	.430000E+01
13	.180000E+01	.118000E+02	.480000E+01
14	.167000E+02	.120000E+02	.570000E+01
15	.180000E+02	.136000E+02	.580000E+01
16	.155000E+02	.134000E+02	.590000E+01
17	.620000E+01	.168000E+02	.520000E+01
18	.380000E+01	.179000E+02	.550000E+01
19	.135000E+02	.180000E+02	.590000E+01
20	.220000E+01	.194000E+02	.490000E+01
21	.900000E+01	.200000E+02	.580000E+01
22	.175000E+02	.195000E+02	.590000E+01
23	.670000E+01	.211000E+02	.610000E+01
24	.200000E+01	.232000E+02	.460000E+01
25	.320000E+01	.229000E+02	.490000E+01
26	.450000E+01	.234000E+02	.500000E+01
27	.970000E+01	.244000E+02	.440000E+01
28	.244000E+02	.140000E+01	.500000E+01
29	.292000E+02	.170000E+01	.410000E+01
30	.324000E+02	.100000E+00	.330000E+01
31	.290000E+02	.330000E+01	.400000E+01
32	.383000E+02	.180000E+01	.220000E+01
33	.418000E+02	.250000E+01	.280000E+01
34	.214000E+02	.650000E+01	.490000E+01
35	.313000E+02	.500000E+01	.330000E+01
36	.361000E+02	.470000E+01	.270000E+01
37	.411000E+02	.530000E+01	.330000E+01
38	.432000E+02	.550000E+01	.380000E+01
39	.494000E+02	.380000E+01	.280000E+01
40	.334000E+02	.760000E+01	.330000E+01
41	.222000E+02	.107000E+02	.490000E+01
42	.271000E+02	.103000E+02	.420000E+01
43	.318000E+02	.980000E+01	.350000E+01
44	.433000E+02	.850000E+01	.410000E+01
45	.311000E+02	.122000E+02	.430000E+01
46	.308000E+02	.138000E+02	.450000E+01
47	.318000E+02	.140000E+02	.470000E+01
48	.298000E+02	.155000E+02	.480000E+01
49	.231000E+02	.160000E+02	.510000E+01
50	.349000E+02	.127000E+02	.450000E+01
51	.414000E+02	.128000E+02	.500000E+01
52	.433000E+02	.154000E+02	.580000E+01
53	.340000E+02	.175000E+02	.580000E+01
54	.379000E+02	.183000E+02	.640000E+01

55	.3910000E+02	.1800000F+02	.6300000E+01
56	.3370000E+02	.1980000F+02	.6700000E+01
57	.3950000E+02	.2050000F+02	.6700000E+01
58	.3020000E+02	.2140000F+02	.6800000E+01
59	.3750000E+02	.2200000F+02	.6800000E+01
60	.4250000E+02	.2230000F+02	.6800000E+01
61	.2380000E+02	.2230000F+02	.6000000E+01
62	.2230000E+02	.2610000F+02	.6800000E+01
63	.2490000E+02	.2630000F+02	.7000000E+01
64	.4200000E+02	.2540000F+02	.6700000E+01
65	.4850000E+02	.2510000F+02	.5400000E+01
66	.1030000E+02	.2560000F+02	.4800000E+01
67	.8700000E+01	.2700000F+02	.4500000E+01
68	.4300000E+01	.2720000F+02	.4000000E+01
69	.2100000E+01	.2970000F+02	.3300000E+01
70	.1420000E+02	.2900000F+02	.5100000E+01
71	.1970000E+02	.2840000F+02	.6500000E+01
72	.3300000E+02	.2850000F+02	.7900000E+01
73	.2960000E+02	.3050000F+02	.7700000E+01
74	.2560000E+02	.3070000F+02	.8100000E+01
75	.4820000E+02	.3080000F+02	.4900000E+01
76	.4410000E+02	.3130000F+02	.5300000E+01
77	.4690000E+02	.3290000F+02	.4700000E+01
78	.4530000E+02	.3310000F+02	.4700000E+01
79	.3950000E+02	.3250000F+02	.5800000E+01
80	.1380000E+02	.3450000F+02	.5000000E+01
81	.1080000E+02	.3580000F+02	.5100000E+01
82	.1920000E+02	.3600000F+02	.6500000E+01
83	.2030000E+02	.3690000F+02	.6400000E+01
84	.2780000E+02	.3630000F+02	.6500000E+01
85	.4090000E+02	.3660000F+02	.4400000E+01
86	.4790000E+02	.3640000F+02	.4000000E+01
87	.1100000E+01	.3940000F+02	.3900000E+01
88	.1320000E+02	.3930000F+02	.5600000E+01
89	.3300000E+02	.3850000F+02	.5500000E+01
90	.1880000E+02	.4210000F+02	.5400000E+01
91	.3530000E+02	.4060000F+02	.4900000E+01
92	.3630000E+02	.4170000F+02	.4500000E+01
93	.4370000E+02	.4110000F+02	.3500000E+01
94	.2880000E+02	.4220000F+02	.5200000E+01
95	.3230000E+02	.4280000F+02	.4800000E+01
96	.1510000E+02	.4460000F+02	.4900000E+01
97	.1400000E+02	.4590000F+02	.4600000E+01
98	.1830000E+02	.4740000F+02	.4200000E+01
99	.1530000E+02	.4830000F+02	.4100000E+01
100	.1860000E+02	.4600000F+02	.4600000E+01
101	.2400000E+02	.4850000F+02	.3900000E+01
102	.3240000E+02	.4850000F+02	.3600000E+01
103	.3840000E+02	.4560000F+02	.3600000E+01
104	.4150000E+02	.4700000F+02	.2900000E+01
105	.4700000E+02	.4750000F+02	.2700000E+01

ELFMENT	NODE 1	NODE 2	NODE 3
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1	63	62	71
2	63	62	61
3	62	71	22
4	71	63	74
5	62	61	22
6	61	63	58
7	71	22	70
8	63	74	73
9	74	71	82
10	61	22	49
11	63	58	73
12	58	61	48
13	22	70	66
14	70	71	80
15	74	73	84
16	71	82	80
17	82	74	83
18	22	49	15
19	49	61	48
20	58	73	72
21	48	58	56
22	70	66	67
23	66	22	19
24	80	70	81
25	73	84	89
26	84	74	83
27	82	80	88
28	83	82	90
29	49	15	41
30	15	22	16
31	48	49	46
32	73	72	79
33	72	58	56
34	56	48	53
35	66	67	27
36	67	70	81
37	22	19	16
38	19	66	27
39	81	80	88
40	84	89	94
41	89	73	79
42	83	84	94
43	88	82	90
44	90	83	94
45	15	41	14
46	41	49	42
47	16	15	14

48	49	46	42
49	46	48	47
50	72	79	64
51	56	72	59
52	48	53	47
53	53	56	54
54	67	27	68
55	81	67	68
56	19	16	17
57	27	19	21
58	88	81	87
59	89	94	95
60	79	89	85
61	90	88	96
62	94	90	101
63	41	14	34
64	42	41	34
65	14	16	9
66	46	42	45
67	47	46	45
68	79	64	76
69	64	72	59
70	59	56	54
71	53	47	50
72	54	53	50
73	27	68	26
74	68	81	69
75	16	17	12
76	17	19	21
77	21	27	23
78	81	87	69
79	87	88	97
80	94	95	102
81	95	89	91
82	89	85	91
83	85	79	76
84	88	96	97
85	96	90	100
86	90	101	100
87	101	94	102
88	14	34	6
89	34	42	31
90	16	9	10
91	9	14	6
92	42	45	43
93	45	47	50
94	64	76	75
95	59	64	60
96	54	59	57
97	50	54	55

98	68	26	25
99	26	27	23
100	69	68	24
101	17	12	18
102	12	16	16
103	21	17	23
104	95	102	92
105	91	95	92
106	85	91	92
107	76	85	78
108	96	97	99
109	100	96	98
110	101	100	98
111	34	6	2
112	42	31	35
113	31	34	28
114	9	10	8
115	6	9	8
116	45	43	50
117	43	42	40
118	76	75	77
119	75	64	65
120	64	60	65
121	60	59	57
122	57	54	55
123	55	50	51
124	26	25	23
125	25	68	24
126	12	18	13
127	18	17	23
128	10	12	11
129	102	92	103
130	92	85	93
131	85	78	86
132	78	76	77
133	99	96	98
134	6	2	5
135	2	34	28
136	31	35	29
137	35	42	40
138	28	31	29
139	10	8	7
140	8	6	5
141	43	50	40
142	75	77	86
143	60	65	52
144	57	60	55
145	50	51	44
146	51	55	52
147	25	23	20

148	24	25	20
149	18	13	20
150	13	12	11
151	23	18	20
152	11	10	7
153	92	103	93
154	103	102	104
155	85	93	86
156	78	86	77
157	2	5	3
158	35	29	30
159	40	35	36
160	8	7	4
161	5	8	3
162	50	40	36
163	65	52	39
164	52	60	55
165	51	44	52
166	44	50	37
167	103	93	104
168	93	86	105
169	30	35	36
170	7	4	1
171	4	8	3
172	36	50	37
173	52	39	44
174	37	44	38
175	93	104	105
176	36	30	32
177	4	1	3
178	37	36	32
179	39	44	38
180	38	37	33
181	32	37	33
182	38	39	33

CONTOUR NUMBER 1 CONTOUR VALUE = .3000000E+01

ELEMENT	X	Y	LINE	X	Y
139	.89750000E+01	.42250000E+01		.76750000E+01	.55750000E+01
152	.76750000E+01	.55750000E+01		.55857143E+01	.59285714E+01
154	.40200000E+02	.47214286E+02		.41057143E+02	.46800000E+02
159	.33700000E+02	.48500000E+01		.34750000E+02	.61500000E+01
160	.89750000E+01	.42250000E+01		.95983017E+01	.26013986E+01
162	.34750000E+02	.61500000E+01		.35900000E+02	.60333333E+01
163	.48993333E+02	.45733333E+01		.49330769E+02	.54384615E+01
167	.41866667E+02	.46016667E+02		.41057143E+02	.46800000E+02
168	.47207692E+02	.44938462E+02		.45762500E+02	.45100000E+02
169	.33700000E+02	.48500000E+01		.34250000E+02	.24000000E+01
170	.95983017E+01	.26013986E+01		.81571429E+01	.25000000E+01
172	.35900000E+02	.60333333E+01		.38600000E+02	.50000000E+01
173	.48993333E+02	.45733333E+01		.48461538E+02	.45230769E+01
175	.41866667E+02	.46016667E+02		.45762500E+02	.45100000E+02
176	.34250000E+02	.24000000E+01		.34009091E+02	.56363636E+00
178	.38600000E+02	.50000000E+01		.40336364E+02	.43454545E+01
179	.48461538E+02	.45230769E+01		.48160000E+02	.41400000E+01
180	.41520000E+02	.36200000E+01		.42080000E+02	.31000000E+01
181	.40336364E+02	.43454545E+01		.41520000E+02	.36200000E+01
182	.48160000E+02	.41400000E+01		.42080000E+02	.31000000E+01

CONTOUR NUMBER 2 CONTOUR VALUE = .4000000E+01

ELEMENT	X	Y	LINE	X	Y
58	.19083333E+01	.39100000E+02		.18117647E+01	.39394118E+02
62	.23653333E+02	.48073333E+02		.24369231E+02	.48015385E+02
74	.54833333E+01	.32072222E+02		.42987436E+01	.27201428E+02
78	.19083333E+01	.39100000E+02		.54833333E+01	.32072222E+02
79	.18117647E+01	.39394118E+02		.29428571E+01	.40328571E+02
80	.32366667E+02	.46600000E+02		.31500000E+02	.46925000E+02
86	.23653333E+02	.48073333E+02		.23228571E+02	.48142857E+02
87	.24369231E+02	.48015385E+02		.31500000E+02	.46925000E+02
90	.11085714E+02	.76285714E+01		.90083333E+01	.92833333E+01
92	.31362500E+02	.11300000E+02		.28442857E+02	.10157143E+02
100	.42987436E+01	.27201428E+02		.20461538E+01	.26200000E+02
102	.90083333E+01	.92833333E+01		.59250000E+01	.10200000E+02
104	.32366667E+02	.46600000E+02		.34133333E+02	.45477778E+02
110	.23228571E+02	.48142857E+02		.22100000E+02	.48133333E+02
112	.29001314E+02	.33009709E+01		.28033333E+02	.91222222E+01
114	.11085714E+02	.76285714E+01		.12333333E+02	.57333333E+01
115	.12333333E+02	.57333333E+01		.12800000E+02	.47500000E+01
116	.31362500E+02	.11300000E+02		.33350000E+02	.11250000E+02
117	.28442857E+02	.10157143E+02		.28500000E+02	.97000000E+01
128	.59250000E+01	.10200000E+02		.42333333E+01	.10433333E+02
129	.34133333E+02	.45477778E+02		.37466667E+02	.43866667E+02
130	.42144444E+02	.38600000E+02		.40000000E+02	.41400000E+02
136	.29001314E+02	.33009709E+01		.29462500E+02	.21125000E+01
137	.28033333E+02	.91222222E+01		.28500000E+02	.97000000E+01
140	.12800000E+02	.47500000E+01		.12785714E+02	.46428571E+01
141	.33350000E+02	.11250000E+02		.34275000E+02	.10575000E+02
150	.42333333E+01	.10433333E+02		.22000000E+01	.99142857E+01
153	.37466667E+02	.43866667E+02		.40000000E+02	.41400000E+02
155	.42144444E+02	.38600000E+02		.47896643E+02	.36403757E+02
158	.29462500E+02	.21125000E+01		.29600000E+02	.15000000E+01
161	.12785714E+02	.46428571E+01		.12000000E+02	.30500000E+01
162	.34275000E+02	.10575000E+02		.35233333E+02	.10477778E+02
163	.46960000E+02	.84400000E+01		.48984615E+02	.13630769E+02
166	.37483333E+02	.96166667E+01		.43025000E+02	.81000000E+01
168	.47896643E+02	.36403757E+02		.47899723E+02	.36403414E+02
171	.12000000E+02	.30500000E+01		.11600000E+02	.13272727E+01
172	.35233333E+02	.10477778E+02		.37483333E+02	.96166667E+01
173	.46960000E+02	.84400000E+01		.43769231E+02	.81384615E+01
174	.43025000E+02	.81000000E+01		.43266667E+02	.75000000E+01
177	.11328571E+02	.11000000E+01		.11600000E+02	.13272727E+01
179	.43769231E+02	.81384615E+01		.43266667E+02	.75000000E+01

CONTOUR NUMBER 3 CONTOUR VALUE = .5000000E+01

ELFMENT	X	Y	LINE	X	Y
12	.28800000F+02	.16633333F+02		.29840000E+02	.16090000F+02
13	.12900000F+02	.27866667E+02		.11609091E+02	.24490909E+02
19	.28800000F+02	.16633333E+02		.25333333E+02	.15833333E+02
21	.29840000F+02	.16090000E+02		.30210526E+02	.15952632E+02
22	.12900000F+02	.27866667E+02		.13283333E+02	.28666667E+02
23	.11609091F+02	.24490909E+02		.10881818E+02	.24218182E+02
29	.21733333F+02	.11022222E+02		.22650000E+02	.13350000E+02
31	.25333333F+02	.15833333E+02		.24383333E+02	.15633333E+02
34	.30210526E+02	.15952632E+02		.30640000E+02	.15900000E+02
36	.13283333F+02	.28666667E+02		.10450000E+02	.34333333E+02
38	.10881818F+02	.24218182E+02		.11220000E+02	.21840000F+02
45	.21733333F+02	.11022222E+02		.21512500E+02	.10862500E+02
46	.22650000F+02	.13350000E+02		.23544444E+02	.15366667E+02
48	.24383333F+02	.15633333E+02		.23544444E+02	.15366667E+02
52	.30640000F+02	.15900000E+02		.32400000E+02	.14954545E+02
55	.10450000F+02	.34333333E+02		.10209091E+02	.35018182E+02
57	.11220000F+02	.21840000E+02		.94000000E+01	.22514286E+02
58	.99916667F+01	.36100000F+02		.89294118E+01	.39335294E+02
59	.30550000F+02	.42500000E+02		.32500000E+02	.41571429E+02
60	.36590909F+02	.37636364E+02		.40300000E+02	.34842857E+02
61	.14828571F+02	.43842857E+02		.15840000E+02	.44100000E+02
62	.20186667F+02	.43806667E+02		.28061538E+02	.43169231E+02
63	.21512500F+02	.10862500E+02		.20812500E+02	.71875000E+01
65	.13964706F+02	.10223529E+02		.14786667E+02	.98533333E+01
71	.32400000F+02	.14954545E+02		.34553846E+02	.14546154E+02
72	.34553846F+02	.14546154E+02		.35689474E+02	.14173684E+02
73	.44999000F+01	.23401899E+02		.45043297E+01	.23400833E+02
74	.10209091F+02	.35018182E+02		.10316667E+02	.35461111E+02
75	.59555556F+01	.15600000E+02		.96500000E+01	.12275000E+02
77	.94000000F+01	.22514286E+02		.86411765E+01	.23235294E+02
78	.99916667F+01	.36100000F+02		.10316667E+02	.35461111E+02
79	.89294118F+01	.39335294E+02		.13680000E+02	.43260000E+02
80	.30550000F+02	.42500000E+02		.29250000E+02	.42987500E+02
81	.32500000F+02	.41571429E+02		.34916667E+02	.40250000E+02
82	.36590909F+02	.37636364E+02		.34916667E+02	.40250000E+02
83	.40300000F+02	.34842857E+02		.43033333E+02	.33066667E+02
84	.14828571F+02	.43842857E+02		.13680000E+02	.43260000E+02
85	.15840000F+02	.44100000E+02		.18700000E+02	.44050000E+02
86	.20186667F+02	.43806667E+02		.18700000E+02	.44050000E+02
87	.28061538F+02	.43169231E+02		.29250000E+02	.42987500E+02
88	.20812500F+02	.71875000E+01		.16910000E+02	.61900000E+01
90	.13964706F+02	.10223529E+02		.12425000E+02	.11450000E+02
91	.14786667F+02	.98533333E+01		.16910000E+02	.61900000E+01
94	.47175000F+02	.30925000E+02		.47855556E+02	.30500000E+02
97	.35689474F+02	.14173684E+02		.36866667E+02	.14172222E+02
98	.44999000F+01	.23401899E+02		.44935323E+01	.23397512E+02
99	.45043297F+01	.23400833E+02		.86411765E+01	.23235294E+02
101	.59555556F+01	.15600000E+02		.43416667E+01	.15191667E+02
102	.96500000F+01	.12275000E+02		.12425000E+02	.11450000E+02
107	.43033333F+02	.33066667E+02		.44700000E+02	.32200000E+02
113	.24385075F+02	.14253731E+01		.24402299F+02	.14009495E+01
118	.47175000F+02	.30925000E+02		.45500000E+02	.32100000E+02
119	.47855556F+02	.30500000E+02		.48260000E+02	.29660000E+02
123	.36066667F+02	.14172222E+02		.41393506E+02	.12799000F+02
124	.44935323F+01	.23397512E+02		.34916667E+01	.22750000E+02
126	.43416667F+01	.15191667E+02		.23714286E+01	.13542857E+02
132	.44700000F+02	.32200000E+02		.45500000E+02	.32100000F+02
135	.24385075F+02	.14253731E+01		.24388353E+02	.13983361F+01
138	.24402299F+02	.14009495E+01		.24402665E+02	.14001666E+01
145	.41393506F+02	.12799000E+02		.41401655E+02	.12797612E+02
147	.34916667F+01	.22750000E+02		.25750000E+01	.19541667E+02
149	.23714286F+01	.13542857E+02		.24666667E+01	.19150000E+02
151	.24666667F+01	.19150000E+02		.25750000E+01	.19541667E+02
153	.44926667F+02	.12306667E+02		.48638462E+02	.21823077E+02
165	.41401055F+02	.12797612E+02		.43300000E+02	.12152941E+02
173	.44926667F+02	.12306667E+02		.43300000E+02	.12152941E+02

CONTOUR NUMBER 4 CONTOUR VALUE = .6000000E+01

ELEMENT	X	Y	LINE	X	Y
3	.17866667E+02	.20983333E+02		.18033333E+02	.20233333E+02
5	.23762425E+02	.22283300E+02		.18033333E+02	.20233333E+02
7	.17866667E+02	.20983333E+02		.17735714E+02	.28614286E+02
10	.23762425E+02	.22283300E+02		.23799534E+02	.22295803E+02
12	.23802999E+02	.22296602E+02		.30040000E+02	.19040000E+02
14	.17735714E+02	.28614286E+02		.17733333E+02	.30433333E+02
16	.17400000E+02	.35500000E+02		.17733333E+02	.30433333E+02
19	.23799534E+02	.22295803E+02		.23802999E+02	.22296602E+02
21	.30040000E+02	.19040000E+02		.32263158E+02	.18215789E+02
25	.30400000E+02	.37400000E+02		.32227273E+02	.36681818E+02
27	.17400000E+02	.35500000E+02		.15866667E+02	.37833333E+02
28	.19018182E+02	.38772727E+02		.19700000E+02	.38980000E+02
32	.38180952E+02	.32119048E+02		.38457895E+02	.32289474E+02
34	.32263158E+02	.18215789E+02		.33933333E+02	.18011111E+02
40	.30400000E+02	.37400000E+02		.28184615E+02	.38569231E+02
41	.32227273E+02	.36681818E+02		.38457895E+02	.32289474E+02
42	.28184615E+02	.38569231E+02		.23133333E+02	.38666667E+02
43	.15866667E+02	.37833333E+02		.19018182E+02	.38772727E+02
44	.19700000E+02	.38980000E+02		.23133333E+02	.38666667E+02
50	.38880952E+02	.32119048E+02		.40055556E+02	.30922222E+02
53	.33933333E+02	.18011111E+02		.35300000E+02	.17766667E+02
68	.40055556E+02	.30922222E+02		.43050000E+02	.28350000E+02
72	.35300000E+02	.17766667E+02		.37268421E+02	.17121053E+02
77	.68764706E+01	.21294118E+02		.74666667E+01	.20733333E+02
94	.43050000E+02	.28350000E+02		.44411111E+02	.27500000E+02
97	.37268421E+02	.17121053E+02		.38400000E+02	.17116667E+02
99	.68764706E+01	.21294118E+02		.65000000E+01	.21309091E+02
103	.66444444E+01	.20622222E+02		.74666667E+01	.20733333E+02
119	.44411111E+02	.27500000E+02		.45500000E+02	.25238462E+02
120	.45928571E+02	.23900000E+02		.45500000E+02	.25238462E+02
123	.38400000E+02	.17116667E+02		.39630769E+02	.16800000E+02
124	.64083333E+01	.21250000E+02		.65000000E+01	.21309091E+02
127	.66444444E+01	.20622222E+02		.62166667E+01	.20566667E+02
143	.45928571E+02	.23900000E+02		.43140000E+02	.16780000E+02
146	.39630769E+02	.16800000E+02		.41620000E+02	.16440000E+02
147	.64083333E+01	.21250000E+02		.63250000E+01	.20958333E+02
151	.62166667E+01	.20566667E+02		.63250000E+01	.20958333E+02
164	.43140000E+02	.16780000E+02		.41620000E+02	.16440000E+02

CONTOUR NUMBER 5 CONTOUR VALUE = .7000000E+01

ELEMENT	X	Y	LINE	X	Y
1	.24890932E+02	.26299302E+02		.24892730E+02	.26302936E+02
2	.24890932E+02	.26299302E+02		.24899231E+02	.26297202E+02
4	.24892730E+02	.26302936E+02		.21543750E+02	.29118750E+02
6	.24899231E+02	.26297202E+02		.24918485E+02	.26282910E+02
9	.21543750E+02	.29118750E+02		.21200000E+02	.34343750E+02
11	.24918485E+02	.26282910E+02		.30066667E+02	.23422222E+02
15	.28550000E+02	.33883333E+02		.27112500E+02	.34550000E+02
17	.21200000E+02	.34343750E+02		.22170588E+02	.34711765E+02
20	.30066667E+02	.23422222E+02		.30709091E+02	.22690909E+02
25	.28550000E+02	.33883333E+02		.30681818E+02	.33045455E+02
26	.27112500E+02	.34550000E+02		.22170588E+02	.34711765E+02
32	.35785714E+02	.30214286E+02		.33247368E+02	.31236842E+02
33	.30709091E+02	.22690909E+02		.33525000E+02	.21975000E+02
41	.30681818E+02	.33045455E+02		.33247368E+02	.31236842E+02
50	.35785714E+02	.30214286E+02		.39750000E+02	.26175000E+02
51	.33525000E+02	.21975000E+02		.36681818E+02	.23181818E+02
69	.39750000E+02	.26175000E+02		.36681818E+02	.23181818E+02

CONTOUR NUMBER 6 CONTOUR VALUE = .8000000E+01

ELEMENT	X	Y	LINE	X	Y
4	.25536364F+02	.30300000E+02		.25231250E+02	.30556250E+02
8	.25536364F+02	.30300000E+02		.26600000E+02	.30650000F+02
9	.25231250F+02	.30556250E+02		.25200000E+02	.31031250E+02
15	.26600000F+02	.30650000E+02		.25737500E+02	.31050000E+02
17	.25200000F+02	.31031250E+02		.25288235E+02	.31064706E+02
26	.25737500F+02	.31050000E+02		.25288235E+02	.31064706E+02

CONTOUR X

Y

.3000E+01	.5585714E+01	.5928571E+01
.3000E+01	.7675000E+01	.5575000E+01
.3000E+01	.8975000E+01	.4225000E+01
.3000E+01	.9598302E+01	.2601399E+01
.3000E+01	.8157143E+01	.2500000E+01
-.3000E+01	.4020000E+02	.4721429E+02
-.3000E+01	.4105714E+02	.4680000E+02
-.3000E+01	.4186667E+02	.4601667E+02
-.3000E+01	.4576250E+02	.4510000E+02
-.3000E+01	.4720769E+02	.4493846E+02
.3000E+01	.4933077E+02	.5438462E+01
.3000E+01	.4899333E+02	.4573333E+01
.3000E+01	.4846154E+02	.4523077E+01
.3000E+01	.4816000E+02	.4140000E+01
.3000E+01	.4208000E+02	.3100000E+01
.3000E+01	.4152000E+02	.3620000E+01
.3000E+01	.4033636E+02	.4345455E+01
.3000E+01	.3860000E+02	.5000000E+01
.3000E+01	.3590000E+02	.6033333E+01
.3000E+01	.3475000E+02	.6150000E+01
.3000E+01	.3370000E+02	.4850000E+01
.3000E+01	.3425000E+02	.2400000E+01
.3000E+01	.3400909E+02	.5636364E+00

CONTOUR

X

Y

.4000E+01	.2942857E+01	.4032857E+02
.4000E+01	.1811765E+01	.3939412E+02
.4000E+01	.1908333E+01	.3910000E+02
.4000E+01	.5483333E+01	.3207222E+02
.4000E+01	.4298744E+01	.2720143E+02
.4000E+01	.2046154E+01	.2620000E+02
-.4000E+01	.2210000E+02	.4810333E+02
-.4000E+01	.2322857E+02	.4814286E+02
-.4000E+01	.2365333E+02	.4807333E+02
-.4000E+01	.2436923E+02	.4801538E+02
-.4000E+01	.3150000E+02	.4692500E+02
-.4000E+01	.3236667E+02	.4660000E+02
-.4000E+01	.3413333E+02	.4547778E+02
-.4000E+01	.3746667E+02	.4386667E+02
-.4000E+01	.4000000E+02	.4140000E+02
-.4000E+01	.4214444E+02	.3860000E+02
-.4000E+01	.4789664E+02	.3640376E+02
.4000E+01	.2200000E+01	.9914286E+01
.4000E+01	.4233333E+01	.1043333E+02
.4000E+01	.5925000E+01	.1020000E+02
.4000E+01	.9008333E+01	.9283333E+01
.4000E+01	.1108571E+02	.7628571E+01
.4000E+01	.1233333E+02	.5733333E+01
.4000E+01	.1280000E+02	.4750000E+01
.4000E+01	.1278571E+02	.4642857E+01
.4000E+01	.1200000E+02	.3050000E+01
.4000E+01	.1160000E+02	.1327273E+01
.4000E+01	.1132857E+02	.1100000E+01
-.4000E+01	.2960000E+02	.1500000E+01
-.4000E+01	.2946250E+02	.2112500E+01
-.4000E+01	.2900131E+02	.3300971E+01
-.4000E+01	.2803333E+02	.9122222E+01
-.4000E+01	.2850000E+02	.9700000E+01
-.4000E+01	.2844286E+02	.1015714E+02
-.4000E+01	.3136250E+02	.1130000E+02
-.4000E+01	.3335000E+02	.1125000E+02
-.4000E+01	.3427500E+02	.1057500E+02
-.4000E+01	.3523333E+02	.1047778E+02
-.4000E+01	.3748333E+02	.9616667E+01
-.4000E+01	.4302500E+02	.8100000E+01
-.4000E+01	.4326667E+02	.7500000E+01
-.4000E+01	.4376923E+02	.8138462E+01
-.4000E+01	.4696000E+02	.8440000E+01
-.4000E+01	.4898462E+02	.1363077E+02

CONTOUR X

Y

.5000E+01	.2440230E+02	.1400950E+01
.5000E+01	.2438507E+02	.1425373E+01
.5000E+01	.2438835E+02	.1398336E+01
.5000E+01	.4826000E+02	.2964000E+02
.5000E+01	.4785556E+02	.3050000E+02
.5000E+01	.4717500E+02	.3092500E+02
.5000E+01	.4550000E+02	.3210000E+02
.5000E+01	.4470000E+02	.3220000E+02
.5000E+01	.4303333E+02	.3306667E+02
.5000E+01	.4030000E+02	.3484286E+02
.5000E+01	.3659091E+02	.3763636E+02
.5000E+01	.3491667E+02	.4025000E+02
.5000E+01	.3250000E+02	.4157143E+02
.5000E+01	.3055000E+02	.4250000E+02
.5000E+01	.2925000E+02	.4298750E+02
.5000E+01	.2806154E+02	.4316923E+02
.5000E+01	.2018667E+02	.4380667E+02
.5000E+01	.1870000E+02	.4405000E+02
.5000E+01	.1584000E+02	.4410000E+02
.5000E+01	.1482857E+02	.4384286E+02
.5000E+01	.1368000E+02	.4320000E+02
.5000E+01	.8929412E+01	.3933529E+02
.5000E+01	.9991667E+01	.3610000E+02
.5000E+01	.1031667E+02	.3546111E+02
.5000E+01	.1020909E+02	.3501818E+02
.5000E+01	.1045000E+02	.3433333E+02
.5000E+01	.1328333E+02	.2866667E+02
.5000E+01	.1290000E+02	.2786667E+02
.5000E+01	.1160909E+02	.2440091E+02
.5000E+01	.1088182E+02	.2421818E+02
.5000E+01	.1122000E+02	.2180000E+02
.5000E+01	.9400000E+01	.2251429E+02
.5000E+01	.8641176E+01	.2323529E+02
.5000E+01	.4504330E+01	.2340083E+02
.5000E+01	.4499900E+01	.2340190E+02
.5000E+01	.4493532E+01	.2330751E+02
.5000E+01	.3491667E+01	.2275000E+02
.5000E+01	.2575000E+01	.1954167E+02
.5000E+01	.2466667E+01	.1915000E+02
.5000E+01	.2371429E+01	.1354286E+02
.5000E+01	.4341667E+01	.1516167E+02
.5000E+01	.5955556E+01	.1560000E+02
.5000E+01	.9650000E+01	.1227500E+02
.5000E+01	.1242500E+02	.1145000E+02
.5000E+01	.1396471E+02	.1022353E+02
.5000E+01	.1478667E+02	.9853333E+01
.5000E+01	.1691000E+02	.6190000E+01
.5000E+01	.2081250E+02	.7187500E+01
.5000E+01	.2151250E+02	.1086250E+02
.5000E+01	.2173333E+02	.1102222E+02
.5000E+01	.2265000E+02	.1335000E+02
.5000E+01	.2354444E+02	.1536667E+02
.5000E+01	.2438333E+02	.1563333E+02
.5000E+01	.2533333E+02	.1583333E+02
.5000E+01	.2880000E+02	.1663333E+02
.5000E+01	.2984000E+02	.1600000E+02
.5000E+01	.3021053E+02	.1595263E+02
.5000E+01	.3064000E+02	.1590000E+02
.5000E+01	.3240000E+02	.1495455E+02
.5000E+01	.3455385E+02	.1454615E+02
.5000E+01	.3568947E+02	.1417368E+02
.5000E+01	.3606667E+02	.1417222E+02
.5000E+01	.4139351E+02	.1270990E+02
.5000E+01	.4140105E+02	.1279761E+02
.5000E+01	.4330000E+02	.1215294E+02
.5000E+01	.4492667E+02	.1230667E+02
.5000E+01	.4863846E+02	.2182308E+02

CONTOUR X

Y

.6000E+01	.1786667E+02	.2098333E+02
.6000E+01	.1803333E+02	.2023333E+02
.6000E+01	.2376243E+02	.2228330E+02
.6000E+01	.2379953E+02	.2229580E+02
-.6000E+01	.1786667E+02	.2098333E+02
-.6000E+01	.1773571E+02	.2861429E+02
-.6000E+01	.1773333E+02	.3043333E+02
-.6000E+01	.1740000E+02	.3550000E+02
-.6000E+01	.1586667E+02	.3783333E+02
-.6000E+01	.1901818E+02	.3877273E+02
-.6000E+01	.1970000E+02	.3898000E+02
-.6000E+01	.2313333E+02	.3866667E+02
-.6000E+01	.2818462E+02	.3856923E+02
-.6000E+01	.3040000E+02	.3740000E+02
-.6000E+01	.3222727E+02	.3668182E+02
-.6000E+01	.3845789E+02	.3228947E+02
-.6000E+01	.3888095E+02	.3211905E+02
-.6000E+01	.4005556E+02	.3092222E+02
-.6000E+01	.4305000E+02	.2835000E+02
-.6000E+01	.4441111E+02	.2750000E+02
-.6000E+01	.4550000E+02	.2523846E+02
-.6000E+01	.4592857E+02	.2390000E+02
-.6000E+01	.4314000E+02	.1678000E+02
-.6000E+01	.4162000E+02	.1644000E+02
-.6000E+01	.3963077E+02	.1680000E+02
-.6000E+01	.3840000E+02	.1711667E+02
-.6000E+01	.3726842E+02	.1712105E+02
-.6000E+01	.3530000E+02	.1776667E+02
-.6000E+01	.3393333E+02	.1801111E+02
-.6000E+01	.3226316E+02	.1821579E+02
-.6000E+01	.3004000E+02	.1904000E+02
-.6000E+01	.2380300E+02	.2220660E+02
.6000E+01	.6876471E+01	.2120412E+02
.6000E+01	.7466667E+01	.2073333E+02
.6000E+01	.6644444E+01	.2062222E+02
.6000E+01	.6216667E+01	.2056667E+02
.6000E+01	.6325000E+01	.2095833E+02
.6000E+01	.6408333E+01	.2125000E+02
.6000E+01	.6500000E+01	.2130909E+02
.6000E+01	.6876471E+01	.2120412E+02

CONTOUR X

Y

.7000E+01	.2489093E+02	.2629930E+02
.7000E+01	.2489273E+02	.2630294E+02
.7000E+01	.2154375E+02	.2911875E+02
.7000E+01	.2120000E+02	.3434375E+02
.7000E+01	.2217059E+02	.3471176E+02
.7000E+01	.2711250E+02	.3455000E+02
.7000E+01	.2855000E+02	.3389333E+02
.7000E+01	.3068182E+02	.3304545E+02
.7000E+01	.3324737E+02	.3123684E+02
.7000E+01	.3578571E+02	.3021429E+02
.7000E+01	.3975000E+02	.2617500E+02
.7000E+01	.3668182E+02	.2318182E+02
.7000E+01	.3352500E+02	.2197500E+02
.7000E+01	.3070909E+02	.2269091E+02
.7000E+01	.3006667E+02	.2342222E+02
.7000E+01	.2491849E+02	.2628291E+02
.7000E+01	.2489923E+02	.2629720E+02
.7000E+01	.2489093E+02	.2629930E+02
.8000E+01	.2553636E+02	.3030000E+02
.8000E+01	.2523125E+02	.3055625E+02
.8000E+01	.2520000E+02	.3103125E+02
.8000E+01	.2528824E+02	.3106471E+02
.8000E+01	.2573750E+02	.3105000E+02
.8000E+01	.2660000E+02	.3065000E+02
.8000E+01	.2553636E+02	.3030000E+02

Appendix D.
PROGRAM LISTING

```

OVRPLAY(CONTOUR,0,0)
PROGRAM MAIN(TAPE1=65,OUTPUT=65,INPUT=TAPE1,TAPE5=65,TAPE6=65,
1          TAPE7=513,TAPE2=513,TAPE99)

C
C THIS CONTOUR PROGRAM DEVELOPED BY GRADY PATRICK -- FEB 1977--
C AT MIRADCOM REDSTONE ARSENAL
C
  DIMENSION NL(3)
  COMMON/CONTRL/NCONTR,VAL(20),IFLOW,INM,JMAX,NELM,IPT
  COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
  COMMON/HIPLT/IHI,ITK
  COMMON/CORE/KORE
  NCONTR=0
  IFLOW=1
  INM=20
  JMAX=0
  NELM=0
  IPT=4
  IHI=0
  ITK=0
  KORE=0
  REWIND 1
  REWIND 2
  REWIND 7

C
C THESE STATEMENTS ARE FOR SYSTEM LOADING IN THE MAIN OVERLAY
C
  IF(JMAX.EQ.0) GO TO 10
  BACKSPACE 7
  READ(7) NELM
10 CALL CONNEC(5)
  CALL CONNEC(6)
  WRITE(6,9300)

C
C ESTABLISH CONTROL PARAMETERS
C
20 CALL TEK(1)
  WRITE(6,9100) IFLOW,INM,IPT,IHI,ITK,NCONTR
  READ(5,8000) NAME,IVAL
  IF(NAME.EQ.4HIFLO) IFLOW=IVAL
  IF(NAME.EQ.4HINIM) INM=IVAL
  IF(NAME.EQ.4HIPTS) IPT=IVAL
  IF(NAME.EQ.4HIHIP) IHI=1
  IF(NAME.EQ.4HITK) GO TO 30
  IF(NAME.EQ.4HNCON) NCONTR=IVAL
  IF(NAME.EQ.4HCONT) GO TO 40
  IF(NAME.EQ.3HEND) GO TO 500
  GO TO 20

C
C INITIALIZE TEKTRONIX
C
30 ITK=1
  CALL INITT(0)
  CALL TERM(3,1024)
  CALL CHRST7(3)
  GO TO 20

```

```

40 IF (IHI .NE. 1) GO TO 50
   REWIND 99
   CALL INITAL(99,100,22,0)
   CALL RSTR(1)
50 CONTINUE
   IF (IFLOW .EQ. 3) GO TO 300
   CALL TEK(1)
   WRITE(6,9200) NCONTR
   READ(5,*) (VAL(N),N=1,NCONTR)
   IF (IFLOW .GE. 2) GO TO 300
   READ(1,*) JMAX,NELM
   WRITE(7) JMAX,NELM
   DO 100 I=1,JMAX
     READ(1,*) X,Y,Z
100  WRITE(7) X,Y,Z
     IF (NELM .LE. 0) GO TO 300
     DO 200 I=1,NELM
       READ(1,*) NL(1),NL(2),NL(3)
200  WRITE(7) (NL(K),K=1,3)
300  JFLOW=IABS(IFLOW)
     DO 400 I=JFLOW,3
       CALL OVERLAY(7HCONTOUR,I,0)
400  CONTINUE
     CALL TEK(1)
     IFLOW=3
     IVAL1=IVAL
     IF (IHI .GT. 0) CALL RSTR(2)
     GO TO 10
500 CONTINUE
     IF (IHI .GT. 0) CALL RSTR(2)
     WRITE(6,9400)
     CALL DISCON(6)
     CALL EXIT
8000 FORMAT(A4,I2)
9100 FORMAT(1H * NAME*7X*VALUE*10X*FORMAT A4,I2*/
   A      * IFLO*9X I2,4X*MINUS TO OMIT POINT NUMBERS*/
   B      15X*1*4X*ONLY X,Y AND Z COORDINATES ARE INPUT*/
   C      15X*2*4X*COORDINATES AND ELEMENTS ARE INPUT*/
   D      15X*3*4X*REPLOTTING OF GENERATED CONTOURS*/
   E      * INUM*9X I2,4X*SPACING OF CONTOUR NUMBERING*/
   F      * IPTS*10X I1,4X*SMOOTHING FUNCTION FOR SPLINE FIT*/
   G      * IHIP*10X I1,4X*SET TO 1 FOR HOUSTON INSTRUMENT PLOTS*/
   H      * ITEK*10X I1,4X*SET TO 1 FOR TEKTRONIX OUTPUT*/
   I      * NCON*10X I1,4X*NUMBER OF CONTOURS TO BE PLOTTED 20MAX*/
   J      * CONT*10X*0*4X*TO CONTINUE*/
   K      * END *10X*0*4X*TO END*//)
9200 FORMAT(1H * ENTER*15* CONTOURS IN ASCENDING ORDER FREE FIELD*/)
9300 FORMAT(1H0)
9400 FORMAT(1H0)
   END

```

```

SUBROUTINE TEK(K)
COMMON/HILOT/IHI,ITEK
IF(ITEK .NE. 1) GO TO 400
GO TO(100,200),K
100 CALL FRASE
CALL HOME
GO TO 300
200 CALL NEWLIN
300 CALL TSEND
RETURN
400 WRITE(6,9000)
RETURN
9000 FORMAT(1H)
END

```

	IDENT	KOREFL	
	ENTRY	KOREFL	
	EXT	CPC	
	LIST	D	
*			
*	CALL	KOREFL (A, KORE, KFL)	
*		KFL = FIELD LENGTH	
*		KORE = KFL - ADDRESS OF A-1.	
	VFD	36/0HKOREFL,24/2	
A0SAVE	BSS7	1	
KOREFL	DATA	0	
	SX6	A0	
	SB1	X1	FTN CONVERSION
	SA1	A1+1	FTN CONVERSION
	SA6	A0SAVE	
	SB2	X1	FTN CONVERSION
	SA1	A1+1	FTN CONVERSION
	SB3	X1	FTN CONVERSION
	SX6	R1	
	SA6	R1SAVE	SAVE R1 (ADDRESS OF A)
	SX6	R2	
	SA6	R2SAVE	SAVE R2 (ADDRESS OF KORE)
	SX6	R3	
	SA6	R3SAVE	SAVE R3 (ADDRESS OF KFL)
	MX6	0	
	SA6	LENGTH	
	MEMORY	CM,LENGTH,RECALL	MEMORY MACRO CALL
	SA1	LENGTH	LOAD LENGTH INTO X1 (UPPER HALF)
	LX1	30	SHIFT INTO LOWER HALF
	SX6	X1	FIELD LENGTH INTO X6
	SA2	R3SAVE	
	SA6	X2	STORE LENGTH INTO USER WORD
	SA2	R1SAVE	ADDRESS OF A INTO X2
	TX3	X1-X2	
	SX6	X3-1	KORE INTO X6
	SA1	R2SAVE	
	SA6	X1	STORE KORE INTO USER WORD
	SA1	A0SAVE	
	SA0	X1	
	F0	KOREFL	
LENGTH	DATA	0	STORAGE FOR LENGTH RETURNED BY CPC
R1SAVE	DATA	0	STORAGE FOR R1
R2SAVE	DATA	0	STORAGE FOR R2
R3SAVE	DATA	0	STORAGE FOR R3
	END		

```

OVERLAY(CONTOUR,1.0)
PROGRAM TRIANG
COMMON/CONTRL/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,IPTS
COMMON/CORF/KORF
COMMON A(1)
CALL KOPEFL(A,KORF,KFL)
KORF=64*(KORF/64)
DO 100 I=1,KORF
100 A(I)=0.0
REWIND 7
READ(7) JMAX,NELM
J4=2*JMAX
LK=JMAX+1
LK1=2*JMAX+1
LK2=3*JMAX+1
LK3=4*JMAX+1
LK4=5*JMAX+1
LK5=6*JMAX+1
MK=3*J4
MK=MK+LK5
LDIF=KORF-MK
IF(LDIF.GT.0) GO TO 200
CALL TEK(1)
WRITE(6,9000) MK,KORF
CALL EXIT
200 CALL TRI(A(1),A(LK),A(LK1),A(LK2),A(LK3),A(LK4),A(LK5),JMAX,NELM)
9000 FORMAT(1H1* CORF INSUFFICIENT NEEDED =*I7* AVAILABLE =*I7)
END

```

```

      SUBROUTINE TRI(X,Y,Z,XR,YR,IOMIT,IELM,JMAX,N1)
C
C   THIS ROUTINE FORMULATES TRIANGLES FROM THE NODAL POINT DATA
C
      DIMENSION X(1),Y(1),Z(1),XR(1),YR(1),IOMIT(1),IELM(3,1),IL(5)
      DO 110 IO=1,JMAX
110  IOMIT(IO)=0
      CALL READ(X,Y,Z,JMAX)
C
C   DETERMINE THE CENTER OF THE NODAL POINT DATA TO BEGIN THE TRIANGLES
C
      CALL CENTER(X,Y,JMAX,J1)
120  CALL CLOSE(X,Y,Z,JMAX,J1,J2,J3,IOMIT,1)
      CALL ROT(X,Y,XR,YR,JMAX,J1,J2,J3)
      CALL CLOSE(XR,YR,Z,JMAX,J1,J2,J3,IOMIT,2)
      IF(J3 .NE. 0) GO TO 140
      IOMIT(J1)=0
      J1=J2
      GO TO 120
140  CONTINUE
      N=1
      N1=1
      IELM(1,N1)=J1
      IELM(2,N1)=J2
      IELM(3,N1)=J3
100  IL(1)=IELM(1,N1)
      IL(2)=IELM(2,N1)
      IL(3)=IELM(3,N1)
      IL(4)=IELM(1,N1)
      IL(5)=IELM(2,N1)
      DO 200 M=1,3
      CALL COMPAE(N,N1,IL(M),IL(M+1),IELM,ICOM)
      IF(ICOM .GT. 0) GO TO 200
      CALL ROT(X,Y,XR,YR,JMAX,IL(M),IL(M+1),IL(M+2))
      J3=0
160  CALL CLOSE(XR,YR,Z,JMAX,IL(M),IL(M+1),J3,IOMIT,2)
      IF(J3 .EQ. 0) GO TO 200
      CALL SIDECK(N,IL(M),IL(M+1),J3,IELM,ICLK)
      IF(ICLK .EQ. 0) GO TO 165
      IOMIT(J3)=2
      GO TO 160
165  CALL CHECK(J3,IELM,X,Y,N,ICLK,IOMIT)
      IF(ICLK .EQ. 0) GO TO 170
      IOMIT(J3)=1
      GO TO 160
170  IF(J3 .EQ. 0) GO TO 200
      N=N+1
      IELM(1,N)=IL(M)
      IELM(2,N)=IL(M+1)
      IELM(3,N)=J3
200  CONTINUE
      IF(N .EQ. N1) GO TO 300
      N1=N+1
      GO TO 100
300  CONTINUE
      REWIND 7
      WRITE(7) JMAX,N1
      DO 400 J=1,JMAX
400  WRITE(7) X(J),Y(J),Z(J)
      DO 500 N=1,N1
500  WRITE(7) (IELM(K,N),K=1,3)
      END

```

```

SUBROUTINE READ(X,Y,Z,JMAX)
C
C THIS ROUTINE READS THE INPUT DATA AND FINDS THE MAX AND MIN
C AND THE COORD OF THE CENTER OF THE PLOT
C
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
DIMENSION X(1),Y(1),Z(1)
XMAX=-1.E20
YMAX=-1.E20
XMIN= 1.E20
YMIN= 1.E20
IFLAG=0
DO 100 J=1,JMAX
READ(7) X(J),Y(J),Z(J)
100 IF(X(J) .LT. 0.0 .OR. Y(J) .LT. 0.0) IFLAG=1
IF(IFLAG .EQ. 1) GO TO 500
DO 200 J=1,JMAX
IF(X(J) .GT. XMAX) XMAX=X(J)
IF(X(J) .LT. XMIN) XMIN=X(J)
IF(Y(J) .GT. YMAX) YMAX=Y(J)
IF(Y(J) .LT. YMIN) YMIN=Y(J)
200 CONTINUE
XC=(XMAX+XMIN)*0.5
YC=(YMAX+YMIN)*0.5
RETURN
500 XM=0.0
YM=0.0
DO 600 J=1,JMAX
IF(X(J) .LT. XM) XM=X(J)
IF(Y(J) .LT. YM) YM=Y(J)
600 CONTINUE
DO 700 J=1,JMAX
X(J)=X(J)-XM
Y(J)=Y(J)-YM
700 CONTINUE
GO TO 200
END

```

```

SUBROUTINE CENTER(X,Y,JMAX,J1)
C
C   THIS ROUTINE FINDS THE POINT NEAREST TO THE CENTER
C
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
DIMENSION X(1),Y(1)
J1=0
R1=1.E20
DO 100 J=1,JMAX
R=SQRT((X(J)-XC)**2+(Y(J)-YC)**2)
IF(R .GT. R1) GO TO 100
R1=R
J1=J
100 CONTINUE
RETURN
END

```

```

C      SUBROUTINE CLOSE(X,Y,Z,JMAX,J1,J2,J3,IOMIT,K1)
C
C      THIS ROUTINE FINDS BASED ON K1
C      K1 = 1      THE 2 POINTS NEAREST TO J1
C      K1 = 2      THE POINT NEAREST THE AVERAGE OF J1 AND J2
C
C      DIMENSION X(1),Y(1),Z(1),IOMIT(1)
C      COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
50  SCALE=0.0
      XLIMIT=1.2*ABS(X(J1))
      J3=0
      XR=0.0
      YR=0.0
      IF(K1 .NE. 1) GO TO 100
      J2=0
      XR=X(J1)
      YR=Y(J1)
100  R1=1.E20
200  DO 500 J=1,JMAX
      IF(IOMIT(J) .GT. 0) GO TO 500
      IF(J .EQ. J1 .OR. J .EQ. J2 .OR. J .EQ. J3) GO TO 500
      IF(K1 .EQ. 1) GO TO 290
C
C      CHECK TO SEE IF POINT IS WITHIN XLIMIT
C
      IF(ABS(X(J)) .LT. XLIMIT .AND. Y(J) .GT. SCALE) GO TO 290
C
C      CHECK IF POINT IS GREATER THAN SCALE
C
      IF(Y(J) .LT. SCALE) GO TO 500
      JJ=J1
C
C      CHECK IF POINT IS WITHIN 45 DEG OF J1 AND J2 LINE
C
      A=1.0
      IF(X(J) .LT. 0.0 .AND. X(J1) .LT. 0.0) A=-1.0
      IF(X(J) .LT. 0.0 .AND. X(J2) .LT. 0.0) GO TO 220
      IF(X(J) .GT. 0.0 .AND. X(J1) .LT. 0.0) JJ=J2
210  XX=A*(X(J1)-X(J))
      IF(XX .GE. 0.0) GO TO 290
      IF(Y(J)/ABS(XX) .LT. 1.0) GO TO 500
      GO TO 290
220  JJ=J2
      A=-1.0
      GO TO 210
290  R=SQRT((X(J)-XR)**2+(Y(J)-YR)**2)
      IF(R .GT. R1) GO TO 500
      R1=R
      GO TO(300,400),K1
300  J2=J
      GO TO 500
400  J3=J
500  CONTINUE
600  CONTINUE
      RETURN
      END

```

```

SUBROUTINE ROT(X,Y,XR,YR,JMAX,J1,J2,J3)
C
C *** THIS ROUTINE ROTATES ALL POINTS SO THAT THE X AXES LIES ALONG
C *** J1 TO J2 AND THE Y AXES IS DIRECTED AWAY FROM J3
C *** WITH X(J1) = -X(J2)
C
      DIMENSION X(1),Y(1),YR(1),XR(1)
      D=X(J2)-X(J1)
      IF(D .NE. 0.0) GO TO 200
      SN=1.0
      CS=0.0
      XINC=X(J1)
      GO TO 300
200 IF(Y(J2) .NE. Y(J1)) GO TO 220
      XM=0.0
      DO 210 J=1,JMAX
        XR(J)=X(J)
        YR(J)=Y(J)-Y(J1)
210 CONTINUE
      GO TO 110
220 XM=(Y(J2)-Y(J1))/D
      THETA=ATAN(XM)
      SN=SIN(THETA)
      CS=COS(THETA)
250 XINC=X(J1)-Y(J1)/XM
300 CONTINUE
      DO 100 J=1,JMAX
        XR(J)=X(J)*CS+Y(J)*SN
        YR(J)=XINC*SN+Y(J)*CS-X(J)*SN
100
C
C   SHIFT X AXES TO THE CENTER OF J1 AND J2
C
110 XAVG=(XR(J1)+XR(J2))*0.5
      DO 150 J=1,JMAX
        XR(J)=XR(J)-XAVG
150
      IF(J3 .EQ. 0) GO TO 500
      IF(YR(J3) .LE. 0.0) GO TO 500
      DO 400 J=1,JMAX
        YR(J)=-YR(J)
400
500 CONTINUE
      RETURN
      END

```

```

      SUBROUTINE CHECK(JT,IELM,X,Y,N1,ICLK,IOMIT)
C
C *** THIS ROUTINE CHECKS TO SEE IF THE JOINT THAT HAS BEEN FOUND
C *** DOES NOT HAVE ALL THE POSSIBILITIES USED
C
      DIMENSION X(1),Y(1),IELM(3,1),IOMIT(1)
      IF(IOMIT(JT) .GT. 0) GO TO 2000
      PI=3.1415926
      ICHK=0
      ANG1=0.0
      ANG=0.0
      DO 1000 K=1,N1
      DO 100 I=1,3
      IF(IELM(I,K) .EQ. JT) GO TO 200
100  CONTINUE
      GO TO 1000
200  GO TO (210,220,230),I
210  J1=IELM(2,K)
      J2=IELM(3,K)
      GO TO 300
220  J1=IELM(1,K)
      J2=IELM(3,K)
      GO TO 300
230  J1=IELM(1,K)
      J2=IELM(2,K)
300  A2=(X(J1)-X(J2))**2+(Y(J1)-Y(J2))**2
      B=SQRT((X(JT)-X(J1))**2+(Y(JT)-Y(J1))**2)
      C=SQRT((X(JT)-X(J2))**2+(Y(JT)-Y(J2))**2)
      D=(A2-B*B-C*C)/(-2.*B*C)
      IF(ABS(D) .LE. 0.999999) GO TO 400
      ANG1=0.0
      IF(D .LT. 0.0) ANG1=PI
      GO TO 900
400  CONTINUE
      SIGN=1.
      IF(D .LT. 0.0) SIGN=-1.
      ANG1=ACOS(ABS(D))
      IF(SIGN .GT. 0.0) GO TO 900
      ANG1=PI-ANG1
900  CONTINUE
      ANG=ANG+ANG1
1000 CONTINUE
      THET=2.*PI-ANG
      IF(THET .LE. 0.001) ICHK=1
2000 RETURN
      END

```

```

      SUBROUTINE COMPARE(N,N1,J1,J2,IELM,ICOM)
C
C *** THIS ROUTINE CHECKS TO SEE IF THE JOINTS J1 AND J2 ARE FOUND
C *** IN ANY OTHER TRIANGLE
C
      DIMENSION IELM(3,1)
      ICOM=0
      DO 400 K=1,N
      IF(K .EQ. N1) GO TO 400
      DO 100 K1=1,3
      IF(J1 .NE. IELM(K1,K)) GO TO 100
      GO TO 200
100  CONTINUE
      GO TO 400
200  DO 300 K1=1,3
      IF(J2 .NE. IELM(K1,K)) GO TO 300
      GO TO 500
300  CONTINUE
400  CONTINUE
      RETURN
500  ICOM=1
      RETURN
      END

```



```

OVERLAY (CONTOUR,2,0)
PROGRAM MPCONTR
COMMON/CONTRL/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,IPTS
COMMON/CORE/KORE
COMMON A(1)
CALL KUREFL(A,KORE,KFL)
KORE=64*(KORE/64)
DO 100 I=1,KORE
100 A(I)=0.0
REWIND 7
READ(7) JMAX,NELM
LK=JMAX+1
LK1=2*JMAX+1
LK2=3*JMAX+1
MK=3*NELM+LK2
LDIF=KORE-MK
IF(LDIF.GT. 0) GO TO 400
CALL CONNFC(6)
CALL TEK(1)
WRITE(6,9000) LDIF,KORE
CALL EXIT
400 CALL CONT(A(1),A(LK),A(LK1),A(LK2))
DO 500 I=1,KORE
500 A(I)=0.0
K5=KORE/5
LK1=2*K5+1
LK2=4*K5+1
CALL DISCON(6)
CALL ORDER(A(1),A(LK1),A(LK2),K5,INUM)
CALL CONNFC(6)
9000 FORMAT(1H * CORE INSUFFICIENT NEEDED =*I7* AVAILABLE =*I7)
END

```

```

SUBROUTINE CONT(X,Y,Z,IELM)
DIMENSION X(1),Y(1),Z(1),IELM(3,1)
COMMON/CONTRL/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,IPTS
C
C   A CONTOURING PROGRAM FOR RANDOM SPACED POINTS
C   THE POINTS MAY BE RANDOMLY NUMBERED
C   ALL POINTS MUST BE CONNECTED IN SUCH A MANNER TO FORM
C   NON-OVERLAPING TRIANGLES CALLED ELEMENTS
C
      CALL TEK(1)
C
C   READ THE X - Y COORDINATES AND THE NODAL VALUE
C
      DO 200 J=1,JMAX
      300 READ(7) X(J),Y(J),Z(J)
C
C   READ THE NODES FOR EACH ELEMENT
C
      DO 400 N=1,NELM
      400 READ(7) (IELM(K,N),K=1,3)
      REWIND 7
      WRITE(7) JMAX,NELM
      DO 410 J=1,JMAX
      410 WRITE(7) X(J),Y(J),Z(J)
      DO 420 N=1,NELM
      420 WRITE(7) (IELM(K,N),K=1,3)
      CALL MAXMIN(X,Y,JMAX,IFLOW)
      CALL CONTOUR(X,Y,Z,IELM)
      500 CALL DISCON(6)
      WRITE(6,9000) NCONTR,JMAX,NELM
      WRITE(6,9200)
      DO 600 I=1,JMAX
      600 WRITE(6,9400) I,X(I),Y(I),Z(I)
      WRITE(6,9300)
      DO 700 L=1,NELM
      700 WRITE(6,9500) L,IELM(1,L),IELM(2,L),IELM(3,L)
      REWIND 2
      800 READ(2) K,A,B,I
      IF(EOF(2)) 1300,900
      900 IF(K.GT. 2) GO TO 1200
      GO TO (1000,1100),K
      1000 WRITE(6,9800) I,A,B
      GO TO 800
      1100 WRITE(6,9900) A,B
      GO TO 800
      1200 WRITE(6,9600) I,A
      WRITE(6,9700)
      GO TO 800
      1300 CONTINUE
      CALL CONNEC(5)
      CALL CONNEC(6)

```

```

9000 FORMAT(1H1 *NUMBER OF CONTOURS TO BE PLOTTED =*I5/
1          * NUMBER OF NODES                      =*I5/
2          * NUMBER OF ELEMENTS                    =*I5/)
9100 FORMAT(1H0* CONTOURS TO BE PLOTTED *//)
9200 FORMAT(1H0* NODE*4X*X-COORD*11X*Y-COORD*13X*VALUE*//)
9300 FORMAT(1H1* ELEMENT  NODE 1  NODE 2  NODE 3*//)
9400 FORMAT(15,3E18.7)
9500 FORMAT(4I8)
9600 FORMAT(1H1*CONTOUR NUMBER *I5* CONTOUR VALUE =*E14.7)
9700 FORMAT(1H0* ELEMENT*29X*LINE*/12X*X*14X*Y*19X*X*14X*Y*//)
9800 FORMAT(15,2E15.8)
9900 FORMAT(1H+,39X,2E15.8)
      END

```

```

SUBROUTINE CONTOUR(X,Y,Z,IELM)
COMMON/CONTRL/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,TPTS
COMMON/HIPLT/IHI,ITEK
DIMENSION X(1),Y(1),IELM(3,1),F(4),TX(4),TY(4)
DIMENSION LABL(20),IAR(6),7(1)
DO 100 I=1,20
100 LABL(I)=0
DO 1100 K=1,NCONTR
N=0
NCONTR1=NCONTR+10
WRITE(2) NCONTR1,VAL(K),VAL(K),K
DO 1000 J=1,NELM
J1=IELM(1,J)
J2=IELM(2,J)
J3=IELM(3,J)
F(1)=Z(J1)
F(2)=Z(J2)
F(3)=Z(J3)
F(4)=F(1)
TX(1)=X(J1)
TX(2)=X(J2)
TX(3)=X(J3)
TX(4)=TX(1)
TY(1)=Y(J1)
TY(2)=Y(J2)
TY(3)=Y(J3)
TY(4)=TY(1)
IF(K.GT. 1) GO TO 300
IF(ITEK.NE. 1) GO TO 300
CALL MOVEA(TX(1),TY(1))
DO 200 M=2,4
200 CALL DRAWA(TX(M),TY(M))
300 CONTINUE
BA=AMIN1(F(1),F(2),F(3))
AA=AMAX1(F(1),F(2),F(3))
IF(VAL(1).GT. AA .OR. VAL(NCONTR).LT. BA) GO TO 1100
IF(VAL(K).GT. AA .OR. VAL(K).LT. BA) GO TO 1000
IRGN=0
XX1=0.0
YY1=0.0
DO 900 L=1,3
IF(F(L).EQ. VAL(K)) F(L)=F(L)*1.0001
IF(F(L+1).EQ. VAL(K)) F(L+1)=F(L+1)*1.0001
IF((F(L)-VAL(K))*(VAL(K)-F(L+1))) 900,500,500
500 ALP=(VAL(K)-F(L))/(F(L+1)-F(L))
XX=TX(L)+ALP*(TX(L+1)-TX(L))
YY=TY(L)+ALP*(TY(L+1)-TY(L))
IF(IRGN.NE. 1) GO TO 800
IF(XX1.EQ. XX .AND. YY1.EQ. YY) GO TO 800
IF(ITEK.EQ. 1) CALL DASHA(XX,YY,3)
IRGN1=IRGN+1
WRITE(2) IRGN1,XX,YY,J
LABL(K)=LABL(K)+1
LB=LABL(K)
IF(MOD(LB,INUM)) 700,600,700
600 IF(ITEK.NE. 1) GO TO 700

```

```

      CALL CHR$17(4)
      CALL FFORM(VAL(K),6,1,IAR,32)
      CALL JUSTER(6,IAR,0,32,LEN,IOFSET)
      CALL MOVREL(IOFSET,0)
      CALL HLABEL('FN',IAR(6-LEN+1))
700  IBGN=0
      N=0
      GO TO 900
800  IF(ITEK .EQ. 1) CALL MOVEA(XX,YY)
      IRGN1=IRGN+1
      IF(N .NE. 0) BACKSPACE 2
      WRITE(2) IRGN1,XX,YY,J
      XX1=XX
      YY1=YY
      IBGN=1
      N=1
900  CONTINUE
1000 IRGN=0
1100 CONTINUE
      IF(ITEK .NE. 1) RETURN
      CALL BELL
      CALL TSEND
      CALL TINPUT(ICR)
      RETURN
      END

```

```

SUBROUTINE MAXMIN(X,Y,JMAX,IFLOW)
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
COMMON/HILOT/IHI,ITEK
DIMENSION X(1),Y(1)
IF (IABS(IFLOW) .EQ. 1) GO TO 200
XMAX=-1.E20
XMIN= 1.E20
YMAX=-1.E20
YMIN= 1.E20
DO 100 J=1,JMAX
XMAX=AMAX1(XMAX,X(J))
XMIN=AMIN1(XMIN,X(J))
YMAX=AMAX1(YMAX,Y(J))
YMIN=AMIN1(YMIN,Y(J))
100 CONTINUE
200 IF (ITEK .NE. 1) GO TO 300
CALL SWINDO(200,650,50,650)
CALL DWINDO(XMIN,XMAX,YMIN,YMAX)
CALL TEK(1)
300 CONTINUE
RETURN
END

```

```

SUBROUTINE ORDER(X,Y,IFLAG,LMAX,INUM)
C
C   THIS ROUTINE ORDERS THE CONTOUR LINES TO FORM A CONTINUOUS LINE
C
COMMON/HIPLLOT/IHI,ITEK
DIMENSION X(2,1),Y(2,1),IFLAG(1)
REWIND 2
ISTOP=0
100 READ(2) K,CON,CON1,KK
IF(FOF(2)) 2400,200
200 MORE=0
IF(K .GT. 100) GO TO 2400
DO 300 I=1,LMAX
300 IFLAG(I)=-1
CONT=CON
N=1
IREO=0
400 READ(2) J1,A,R,KK
IF(FOF(2)) 2500,500
500 CONTINUE
IF(J1 .GT. 2) GO TO 900
X(J1,N)=A
Y(J1,N)=B
READ(2) J2,C,D,KK
IF(FOF(2)) 2400,600
600 CONTINUE
IF(J2 .GT. 2) GO TO 900
X(J2,N)=C
Y(J2,N)=D
Z1=A-C
Z2=B-D
IF(ABS(Z1) .GT. 0.001 .AND. ABS(Z2) .GT. 0.001) GO TO 700
GO TO 400
700 CONTINUE
IFLAG(N)=0
IREO=IREO+1
N=N+1
KMAX = N - 1
IF(IREO .LT. LMAX) GO TO 400
MORE=1
DO 800 IRS=1,5
800 BACKSPACE 2
900 BACKSPACE 2
NMAX=1
K=1
IF(IREO .LT. 2) GO TO 100
WRITE(6,9000)
1000 DO 1400 J1=1,KMAX
DO 1300 I1= 1, 2
ILIKE = 0
IF(IFLAG(I1) .GT. 0) GO TO 1400
A=X(I1,J1)
B=Y(I1,J1)
DO 1200 J = 1, KMAX
DO 1100 I = 1, 2
IF(J .EQ. J1 .AND. I .EQ. I1) GO TO 1200
IF(IFLAG(I) .GT. 0) GO TO 1200
AA=A-X(I,J)

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```

      RR=R-Y(I,J)
      IF(ABS(AA) .GT. 0.001 .AND. ABS(RR) .GT. 0.001) GO TO 1100
      ILIKE = ILIKE + 1
      GO TO 1300
1100 CONTINUE
1200 CONTINUE
      IF(ILIKE .EQ. 0) GO TO 1700
1300 CONTINUE
1400 CONTINUE
      DO 1500 J1 = 1, KMAX
      I1 = 1
      IF(IFLAG(J1) .GT. 0) GO TO 1500
      GO TO 1600
1500 CONTINUE
1600 A=X(I1,J1)
      R=Y(I1,J1)
1700 WRITE(7) CONT,A,R
      WRITE(6,9100) CONT,A,R
      K = 1
      IF(I1 .EQ. 1) K = 2
      WRITE(7) CONT,X(K,J1),Y(K,J1)
      WRITE(6,9100) CONT,X(K,J1),Y(K,J1)
      A = X(K,J1)
      R = Y(K,J1)
      IFLAG(J1)=1
      ICHK = 0
1800 DO 2000 J=1,KMAX
      IF(IFLAG(J) .GT. 0) GO TO 2000
      DO 1900 I=1,2
      Z1=A-X(I,J)
      Z2=R-Y(I,J)
      IF(ABS(Z1) .GT. 0.001 .OR. ABS(Z2) .GT. 0.001) GO TO 1900
      IFLAG(J)=1
      ICHK=0
      N=2
      IF(I .EQ. 2) N=1
      A=X(N,J)
      R=Y(N,J)
      WRITE(7) CONT,A,R
      WRITE(6,9100) CONT,A,R
      NMAX=NMAX+1
      GO TO 2000
1900 CONTINUE
2000 CONTINUE
      IF(NMAX .EQ. KMAX) GO TO 2100
      IF(ICHK .GT. 0) NMAX=NMAX+1
      IF(ICHK .GT. 0) GO TO 2100
      ICHK=1
      GO TO 1800
2100 CONTINUE
      CONT=-1.*CONT
      IF(ISTOP .GT. 0) GO TO 2400
      IF(NMAX .EQ. KMAX .AND. MORE .EQ. 0) GO TO 100
      IF(NMAX .EQ. KMAX .AND. MORE .EQ. 1) GO TO 200
2300 GO TO 1000
2400 CONTINUE
      RETURN
2500 ISTOP=1
      GO TO 1000
9000 FORMAT(1H1* CONTOUR*4X*X*14X*Y*//)
9100 FORMAT(1H F12.4,2(2X,F14.7))
      END

```

```

OVERLAY(CONTOUR,3,0)
PROGRAM MPLOT
COMMON/CORE/KORE
COMMON/CONTR/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,IPTS
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
COMMON A(1)
CALL KOREFL(A,KORE,KFL)
KORE=64*(KORE/64)
DO 100 I=1,KORE
100 A(I)=0.0
CALL CONNED(6)
REWIND 7
READ(7) JMAX,NELM
LK=JMAX+1
LK1=LK+JMAX
LDIF=KORE-LK1-JMAX
IF(LDIF.GT. 0) GO TO 150
CALL TEK(1)
WRITE(6,9000) LDIF,KORE
CALL EXIT
150 CONTINUE
CALL MXMNP(A(1),A(LK),A(LK1),IMAX,SI7,IFLOW)
DO 200 N=1,NELM
200 READ(7) I1,I2,I3
C
C   MXNUM = 100 THIS CONTROLS THE MAXIMUM NUMBER OF CONTOUR POINTS
C   THAT WILL BE SPLINED FITTED AT ANY ONE TIME
C   THIS MAY BE INCREASED DEPENDING ON CORE AVAILABLE
C
MXNUM=100
IK=MXNUM*IPTS
LK=MXNUM+1
LK1=2*MXNUM+1
LK2=IK+LK1
LK3=IK+LK2
LK4=IK+LK3
LK5=IK+LK4
LK6=IK+LK5
LK7=IK+LK6
LK8=IK+LK7
LK9=IK+LK8
LDIF=KORE-LK9
IF(LDIF.GT. 0) GO TO 300
CALL TEK(1)
WRITE(6,9000) LDIF,KORE
CALL EXIT
300 CALL SPLINE(A(1),A(LK),A(LK1),A(LK2),A(LK3),A(LK4),A(LK5),
1      A(LK6),A(LK7),A(LK8),MXNUM,SI7)
9000 FORMAT(1H * CORE INSUFFICIENT IN OVERLAY 3*/ * NEEDED =*I7
1      * AVAILABLE =*I7)
END

```

```

SURROUTINE MXMNPL(X,Y,Z,JMAX,SI7,IFLOW)
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
COMMON/HIPLT/IHI,ITEK
DIMENSION X(1),Y(1),Z(1),A1(2),A2(2),IAR(6)
DATA A1,A2/4*0.0/
XMAX=-1.E20
YMAX=-1.E20
XMIN= 1.E20
YMIN= 1.E20
DO 100 J=1,JMAX
READ(7) X(J),Y(J),Z(J)
XMAX=AMAX1(XMAX,X(J))
XMIN=AMIN1(XMIN,X(J))
YMAX=AMAX1(YMAX,Y(J))
YMIN=AMIN1(YMIN,Y(J))
100 CONTINUE
XMAX=AJNT(XMAX+0.5)
XMIN=AJNT(XMIN-0.5)
YMAX=AJNT(YMAX+0.5)
YMIN=AJNT(YMIN-0.5)
IF(ITEK.NE.1) GO TO 300
CALL TEK(1)
CALL RINITT
CALL NPTS(2)
CALL SLIMX(200,850)
CALL SLIMY(50,700)
CALL DLIMX(XMIN,XMAX)
CALL DLIMY(YMIN,YMAX)
CALL XFRM(4)
CALL YFRM(4)
CALL CHECK(A1,A2)
CALL DSPLAY(A1,A2)
CALL CHRST7(4)
IF(IFLOW.LT.0) GO TO 250
DO 200 J=1,JMAX
CALL FFORM(Z(J),6,1,IAR,32)
CALL JUSTER(6,IAR,1,32,LEN,IOfSET)
CALL MOVEA(X(J),Y(J))
CALL HLABFL(1,43)
CALL MOVREL(IOfSET,-5)
CALL HLABFL(LEN,IAR(6-LEN+1))
200 CONTINUE
250 CALL RELL
CALL TSEND
CALL TINPUT(ICR)
300 IF(IHI.NE.1) RETURN
DX=(XMAX-XMIN)*0.1
DY=(YMAX-YMIN)*0.1
XX=0.0
YY=0.0
ANUM=XMIN
CALL NUMBER(XX,-0.25,0.0,ANUM,0.0,1)
CALL PLOT(XX,YY,3)

```

```

DO 310 I=1,10
XX=2.*FLOAT(I)
ANUM=ANUM+DX
CALL PLOT(XX,YY,2)
CALL PLOT(XX,-0.1,2)
CALL NUMBER(XX,-0.25,0.14,ANUM,0.0,1)
CALL PLOT(XX,YY,3)
310 CONTINUE
XX=0.0
ANUM=YMIN
CALL NUMBER(-0.25,YY,0.14,ANUM,90.,1)
CALL PLOT(XX,YY,3)
DO 320 I=1,10
YY=2.*FLOAT(I)
ANUM=ANUM+DY
CALL PLOT(XX,YY,2)
CALL PLOT(-0.1,YY,2)
CALL NUMBER(-0.25,YY,0.14,ANUM,90.,1)
CALL PLOT(XX,YY,3)
320 CONTINUE
SIZ=20./(YMAX-YMIN)
IF(!FLOW .LT. 0) RETURN
DO 400 J=1,JMAX
XX=X(J)*SIZ
YY=Y(J)*SIZ
CALL PLOT(XX,YY,3)
CALL MARKER(1)
CALL NUMBER(XX+0.1,YY,0.14,Z(J),0.0,1)
400 CONTINUE
RETURN
END

```

```

SUBROUTINE SPLINE(X,Y,XP,YP,A,P,C,D,T,S,MX,SIZ)
COMMON/CONTR/NCONTR,VAL(20),IFLOW,INUM,JMAX,NELM,IPTS
COMMON/HIPLT/IHI,ITEK
COMMON/MXMN/XMAX,XMIN,YMAX,YMIN,XC,YC
DIMENSION X(1),Y(1),YP(1),XP(1),A(1),R(1),C(1),D(1),T(1),S(1)
DIMENSION IAR(6)
50 MORE=0
   IPRNT=0
   IPRNTD=0
   VAK=0.0
   DO 150 I=1,MX
     READ(7) V,X1,Y1
     IF(FOF(7)) 200,100
100 IF(I.EQ. 1) VAK=V
110 IF(VAK.NE. V) GO TO 190
     X(I)=X1
     Y(I)=Y1
150 CONTINUE
     MORE=1
190 BACKSPACE 7
200 I=I-1
     IF(I.LE. 0) GO TO 400
     IF(ITEK.NE. 1) GO TO 210
     CALL FFORM(ABS(VAK),6,1,IAR,32)
     CALL CHRSTZ(4)
     CALL JUSTER(6,IAR,0,32,LEN,IOfSET)
210 CONTINUE
     NOUT=IPTS*I
     J=1
     CALL CURVE(I,X,Y,NOUT,XP,YP,A,P,C,D,T,S)
     IF(ITEK.EQ. 1) CALL MOVEA(XP(1),YP(1))
     IF(IHI.GT. 0) CALL PLOT(XP(1)*SIZ,YP(1)*SIZ,3)
215 J=J+1
     XX=XP(J)*SIZ
     YY=YP(J)*SIZ
     IPRNT=IPRNT+1
     IF(MOD(IPRNT,INUM)) 290,220,290
220 IF(ITEK.EQ. 1) CALL MOVREL(IOfSET,-5)
     IPRNTD=1
     IF(IHI.GT. 0)
       1 CALL NUMRFR(XX,YY,0.21,ABS(VAK),0.0,1)
     XX1=XP(J-1)*SIZ
     YY1=YP(J-1)*SIZ
     IF(IHI.GT. 0) CALL PLOT(XX1,YY1,3)
     IF(ITEK.EQ. 1) CALL HLABEL(LEN,IAR(6-LEN+1))
     IF(ITEK.EQ. 1) CALL MOVEA(XP(J-1),YP(J-1))
     IF(IPRNTD.EQ. 2) GO TO 50
290 IF(ITEK.EQ. 1) CALL DRAWA(XP(J),YP(J))
     IF(IHI.GT. 0) CALL PLOT(XX,YY,2)
     IF(J.LT. NOUT) GO TO 215
     IF(MORE.GT. 0) GO TO 50
     IF(IPRNTD.GT. 0) GO TO 50
     IPRNTD=2
     K=1
     IF(ITEK.EQ. 1) CALL MOVEA(XP(K),YP(K))
     IF(IHI.GT. 0) CALL PLOT(XP(K)*SIZ,YP(K)*SIZ,3)
     GO TO 220
400 CONTINUE
     IF(ITEK.NE. 1) RETURN
     CALL BELL
     CALL TSEND
     CALL TINPUT(ICR)
     RETURN
END

```

```

SUBROUTINE CURVE (NUMIN,XIN,YIN,NUMOUT,XOUT,YOUT,A,B,C,D,T,S)
DIMENSION XIN(1),YIN(1),XOUT(1),YOUT(1)
DIMENSION A(1),B(1),C(1),D(1),T(1),S(1)
S(1) = 0.0
DO 100 I = 2, NUMIN
D1 = XIN(I)-XIN(I-1)
D2 = YIN(I)-YIN(I-1)
100 S(I) = S(I-1)+SQRT(D1*D1+D2*D2)
400 CALL SPLCOF(S,XIN,NUMIN,A,B,C,D,T,2.,0.,2,0.)
DS=S(NUMIN)/(NUMOUT-1)
DO 500 I = 1, NUMOUT
TT = DS*(I-1)
500 CALL SPLTPP(S,XIN,NUMIN,T,0,TT,XOUT(I))
CALL SPLCOF(S,YIN,NUMIN,A,B,C,D,T,2,0.,2,0.)
DO 600 I = 1,NUMOUT
TT = DS*(I-1)
600 CALL SPLTPP(S,YIN,NUMIN,T,0,TT,YOUT(I))
RETURN
END

```

```

SUBROUTINE SPLCOF(X,Y,N,A,B,C,D,T,I1,V1,I2,V2)
C   THIS ROUTINE COMPUTES THE VECTOR OF SECOND DERIVATIVES
C   IN ARRAY T WHICH ARE NEEDED TO SPLINE INTERPOLATE
C   TABULAR DATA STORED IN X AND Y. ALLOWED END CONDITIONS
C   INCLUDE SPECIFICATION OF Y'' OR Y''' AT EACH END.
C   WHEN I1 IS 1 OR 2 THEN V1 IS CHOSEN VALUE OF
C   Y'' OR Y''', RESPECTIVELY, AT X=X(1). I2 AND V2 HAVE A
C   SIMILAR MEANING FOR THE RIGHT END AT X(N).
C   DIMENSION X(1),Y(1),A(1),B(1),C(1),D(1),T(1)
C   FORM THE TRIDIAGONAL SYSTEM DEFINING THE SPLINE
C   COEFFICIENTS.
      N1 = N-1
      DO 10 J = 2, N1
        HJ = X(J)-X(J-1)
        HJ1=X(J+1)-X(J)
        HJP = HJ+HJ1
        A(J) = HJ/HJP
        B(J) = 2.
        C(J) = 1.-A(J)
10    D(J)=6.*((Y(J+1)-Y(J))/HJ1-(Y(J)-Y(J-1))/HJ)/HJP
C   FORM THE EQUATIONS FOR THE END CONDITIONS.
      IF(I1 .EQ. 2) GO TO 20
      H2 = X(2)-X(1)
      B(1) = 2.
      C(1) = 1.
      D(1) = 6.*((Y(2)-Y(1))/H2-V1)/H2
      GO TO 30
20    B(1)=1.
      C(1) = 0.
      D(1) = V1
30    IF(I2 .EQ. 2) GO TO 40
      HN = X(N)-X(N-1)
      A(N) = 1.
      B(N) = 2.
      D(N) = 6.*(V2-(Y(N)-Y(N-1))/HN)/HN
      GO TO 50
40    A(N) = 0.
      B(N) = 1.
      D(N) = V2
C   SOLVE FOR T(1), ... , T(N) USING GAUSS REDUCTION
50    DO 60 K = 1, N1
      R = A(K+1)/B(K)
      B(K+1) = B(K+1)-R*C(K)
60    D(K+1)=D(K+1)-R*D(K)
      T(N) = D(N)/B(N)
      DO 70 J = 1, N1
        K = N-J
70    T(K)=(D(K)-C(K)*T(K+1))/B(K)
      RETURN
      END

```

```

SUBROUTINE SPLTRP(X,Y,N,T,ID,XT,FT)
C   THIS ROUTINE PRODUCES A SPLINE INTERPOLATION VALUE FT
C   CORRESPONDING TO AN X-POSITION XT. WHEN ID EQUALS
C   0,1,2 OR 3, THEN FT TAKES THE VALUE OF Y, Y', Y'', OR
C   THE INTEGRAL OF Y*DX BETWEEN LIMITS X(1) AND X. THE
C   ORIGINAL DATA POINTS ARE STORED IN X(I), Y(I), I=1,
C   ... ,N. THE VECTOR T CONTAINS THE Y''' VALUES RETURNED
C   FROM SUBROUTINE SPLCOF.
      DIMENSION X(1), Y(1), T(1)
      ID1 = ID+1
C   CHECK WHETHER XT IS OUTSIDE THE ORIGINAL DATA RANGE
      IF(XT .LT. X(1)) GO TO 80
      IF(XT .GT. X(N)) GO TO 120
C   DETERMINE THE FIRST DATA POINT TO THE RIGHT OF XT
      DO 30 J = 2, N
      IF(X(J) .GE. XT) GO TO 40
30  CONTINUE
40  J1 = J-1
      HJ = X(J)-X(J1)
      HJ6 = 6.*HJ
      GO TO (50,60,70,72), ID1
50  FT=(T(J1)*(X(J)-XT)**3 + T(J)*(XT-X(J1))**3
      $  +(6.*(Y(J)-Y(J1))-(T(J)-T(J1))*HJ**2)*(XT-X(J1))
      $  +6.*HJ*Y(J1)-T(J1)*HJ**3)/HJ6
      RETURN
60  FT=(-3.*T(J1)*(X(J)-XT)**2+3.*T(J)*(XT-X(J1))**2
      $  +6.*(Y(J)-Y(J1))-(T(J)-T(J1))*HJ**2)/HJ6
      RETURN
70  FT=(T(J1)*(X(J)-XT) + T(J)*(XT-X(J1)))/HJ
      RETURN
72  HX = XT-X(J1)
      FT=.25*T(J1)*(HJ**4-(HJ-HX)**4)+.25*T(J)*HX**4
      $  +(3.*(Y(J)-Y(J1))+.5*(T(J1)-T(J))*HJ**2)*HX**2
      $  +(6.*Y(J1)*HJ-T(J1)*HJ**3)*HX
      FT=FT/HJ6
      IF(J .EQ. 2) RETURN
      DO 74 K = 2, J1
      HK = X(K)-X(K-1)
74  FT=FT+0.5*(Y(K-1)+Y(K))*HK-(T(K-1)+T(K))*HK**3/24.
      RETURN
80  H2 = X(2)-X(1)

```

```

C      DETERMINE THE SLOPE AT THE LEFT END AND INTERPOLATE
C      LINEARLY.
      SLOPE=(Y(2)-Y(1))/H2 - (2.*T(1)+T(2))*H2/6.
      GO TO (90,100,110,115), ID1
90    FT=Y(1) + SLOPE*(XT-X(1))
      RETURN
100   FT=SLOPE
      RETURN
110   FT=0.
      RETURN
115   HX=XT-X(1)
      FT=Y(1)*HX+0.5*SLOPE*HX**2
      RETURN
C      DETERMINE THE SLOPE AT THE RIGHT END AND INTERPOLATE
C      LINEARLY.
120   HN=X(N) - X(N-1)
      SLOPE = (Y(N)-Y(N-1))/HN + (T(N-1)+2.*T(N))*HN/6.
      GO TO (130,100,110,140), ID1
130   FT=Y(N) + SLOPE*(XT-X(N))
      RETURN
140   HX=XT-X(N)
      FT=Y(N)*HX + 0.5*SLOPE*HX**2
      DO 150 J = 2, N
      HJ=X(J) - X(J-1)
150   FT=FT+0.5*(Y(J-1)+Y(J))*HJ-(T(J-1)+T(J))*HJ**3/24.
      RETURN
      END

```

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