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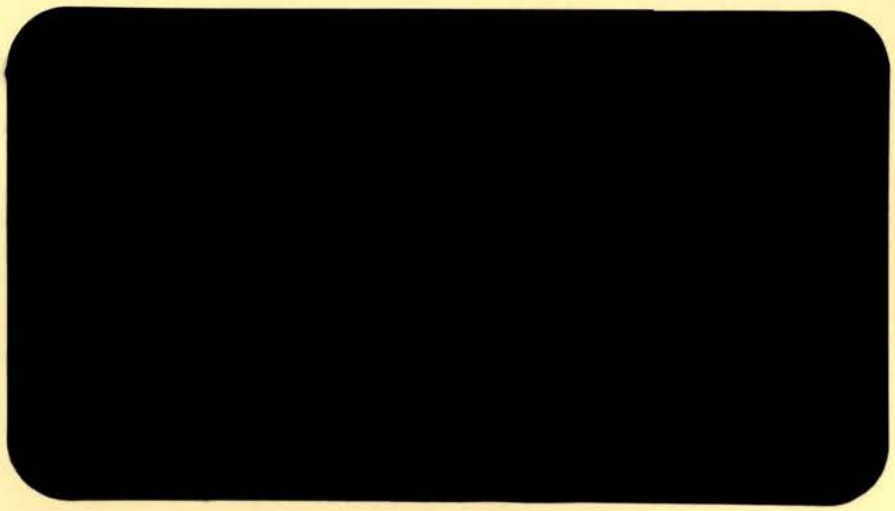

WORKING PAPER SERIES

University of California, Davis
Department of Agricultural Economics

COMPUTATIONAL EXPERIENCE WITH KARMARKAR'S ALGORITHM FOR LINEAR PROGRAMMING. PART I.

by

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COMPUTATIONAL EXPERIENCE WITH KARMARKAR'S ALGORITHM FOR LINEAR PROGRAMMING. PART I.

This paper summarizes the computational results of Karmarkar's algorithm for linear programming as applied to four small numerical examples.

The computer code for the algorithm was written in SPEAKEASY, a very convenient package of mathematical subroutines. The algorithm, however, was not efficiently encoded. Efficiency was not the objective of this study. For example, the matrix (BB^T) is inverted anew at every iteration, while it is possible to use an updating procedure.

The results presented here, nonetheless, show the relative improvement in the speed of convergence of the algorithm obtained by parameterizing αr, the step size, and q, the convergence tolerance. All the symbols are defined as in Paris. The reader is referred to that paper for the explanation of the algorithm. A glossary of terms employed in the computer printouts is given as follows:

GLOSSARY

A	: a (mxn) matrix of coefficients in a LP problem, Ax = b.
ALPHA	: the α parameter in the step size appearing in the recursive relation $x'' = a_o - \alpha r\hat{c}$.
ARTIFC	: the artificial objective function's vector, c, in Phase I.
AUGMENTA	: the augmented matrix (A, -DISCREP) in Phase I.
B	: the RHS vector of coefficients in a LP problem, Ax = b.
BBTROOTS	: the eigenvalues of the (BB^T) matrix.
C	: the objective function's vector of coefficients in a LP problem, c^Tx.
CONVERG	: the value of the convergence criterion c'^Tx'/c'^Ta_o.
CMAX	: the estimated current value of the dual objective function, b^Ty.
CMIN	: the estimated current value of the primal objective function, c^Tx.
CPUF1	: the CPU time (in seconds) employed to complete Phase I.
CPUF2	: the CPU time (in seconds) employed to complete Phase II.

CPULP : the CPU time (in seconds) employed by either LPMAX or LPMIN to solve a given LP problem.

DDUAL : the dual optimal solution returned by either LPMAX or LPMIN.

DISCREP : the discrepancy $d = Ax_o - b$ in the initial step of Phase I.

DUAL : the dual solution vector in Karmarkar's algorithm.

INTERIOP : the strictly interior point returned at the end of Phase I.

ITER : iteration number.

LPMAX : a SPEAKEASY subroutine to solve a LP maximizing problem using the simplex method.

LPMIN : a SPEAKEASY subroutine to solve a LP minimizing problem using the simplex method.

PRIMAL : the primal optimal solution returned by either LPMAX or LPMIN.

OLDX : the optimal primal solution vector of the original problem returned by Karmarkar's algorithm.

Q : the precision parameter q in the convergence tolerance criterion 2^{-q}.

RHS : the vector b in Ax = b.

XPRIME : the x' vector in the initial specification of Karmarkar's algorithm.

The four numerical examples analyzed in this paper are characterized as follows:

	Example			
	N. 1	N. 2	N. 3	N. 4
Dimensions of A	3x4	5x11	3x6	3x7
Min or Max	Min	Max	Max	Max
Nondegenerate	yes	yes	no	no
Multiple Optimal Solutions	no	no	Dual	Primal

The pattern emerging from the results shows that the speed of convergence depends crucially on the parameters α and q, as CPU time and number of iterations (roughly) double as α and q are halved.

Compared with the CPU time employed by the simplex method, the computer code of Karmarkar's algorithm used on the four examples is at least 30 times slower. This is not a bad result if one keeps in mind that the algorithm was inefficiently encoded using SPEAKEASY.

References

Quirino Paris, A Primer on Karmarkar's Algorithm for Linear Programming, Mimeographed, Department of Agricultural Economics, University of California, Davis, January 1985

EXAMPLE N. 1 A (3x4) Min, Unique solution

			Phase I		Phase II		Total	
	α	q	Iter	CPU	Iter	CPU	Iter	CPU
Simplex	-	-	--	--	--	--	--	.43
Karmarkar	.25	25	50	68.44	48	66.25	98	134.65
	.50	25	24	29.16	29	39.62	53	67.78
	.90	25	9	12.79	11	14.96	20	27.75
	1.00	25			infeasible			
	.50	30	28	30.03	200	273.09	228	311.12
	.95	30	converged to wrong point. infeasible.					
	.25	15	34	44.89	29	38.30	63	83.19
	.95	15	5	7.08	7	9.36	12	16.44
	1.00	15	4	5.63	6	8.14	10	13.77
	1.10	15			overflow			

```
:_MINSIMPLEX
EXECUTION STARTED
LPMIN(Q,A,B,O:PRIMAL=P,DDUAL=D) =   11.559

        A          B   C    PRIMAL       DDUAL      CPULP
 **********      **   *   ********    ********    ******
  1 -1  2 1      10   3   3.7353      -2.4706     .42999
 -2  3  1 4      18   6    .058824      .61765
  4  1 -1 0      15   5   0            1.6765
                      0   6.3235
```

SIMPLEX

```
MANUAL MODE
:_$
:_$
:_$
:_$
:_$    EXAMPLE N. 1,  ALPHA=.25      Q=25
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=25
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

        A         B
 **********      **
  1 -1  2 1      10
 -2  3  1 4      18
  4  1 -1 0      15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y=1
:><<< NULL LINE ENTERED >>>

       AUGMENTA          DISCREP   RHS   ARTIFC
 ****************      *******   ***   ******
  1 -1  2 1  9.25      -9.25     10      0
 -2  3  1 4 16.5      -16.5      18      0
  4  1 -1 0 14        -14        15      0
                                         0
                                         1

 ITER    BBTROOTS
 ****   *********
  4       .018263
          .080181
         6
        11.321

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 50   ITERATIONS
```

CONVERG	CPUF1	CMIN	CMAX
*********	*****	*********	*********
1.2195E-7	68.44	2.7136E-7	1.668E-12

XPRIME	OLDX	DUAL	BBTROOTS	INTERIOF
*********	*********	**********	********	********
.27978	3.7353	4.8018E-14	.02352	.27978
.22785	3.042	3.4483E-14	.12982	.22785
.22344	2.9831	3.7807E-14	.2989	.22344
.2502	3.3404	4.7425E-9	6	.2502
2.0325E-8	2.7136E-7			.018726
.018726	0			

P H A S E O N E E N D S

P H A S E T W O B E G I N S

INPUT IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN=1
<<<<< NULL LINE ENTERED >>>

A				B	C
**********				**	*
1	-1	2	1	10	3
-2	3	1	4	18	6
4	1	-1	0	15	5
					0

ITER	BBTROOTS
****	********
2	.017675
	.14314
	.33202
	5

MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY

RESULTS AFTER ITER = 48 ITERATIONS
MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY

CONVERG	CPUF2	CMIN	CMAX
*********	*****	******	******
2.6534E-8	66.25	11.559	11.559

OK

XPRIME	OLDX	DUAL	BBTROOTS
*********	*********	**********	*********
.36028	3.7353	-2.4706	1.0017E-5
.0056738	.058824	.61765	.25442
5.3598E-8	5.5569E-7	1.6765	.68859
.60993	6.3235	3.3633E-9	5
.024113	0		

P H A S E T W O E N D S

```
MANUAL MODE
:_$
:_$
:_$
:_$
:_$
:_$
:_$
:_$      EXAMPLE  N. 1,   ALPHA=.5   Q=25
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.5
:>Q
Q =   25
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

       A         B
 **********   **
  1  -1   2  1   10
 -2   3   1  4   18
  4   1  -1  0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y=1
:><<< NULL LINE ENTERED >>>

     AUGMENTA        DISCREP  RHS  ARTIFC
 ****************   *******  ***  ******
  1  -1   2  1   9.25   -9.25   10      0
 -2   3   1  4  16.5   -16.5    18      0
  4   1  -1  0  14      -14      15      0
                                        0
                                        1


 ITER  BBTROOTS
 ****  ********
  4      .022281
         .10468
        2.8982
        6

 RESULTS AFTER  ITER =  24   ITERATIONS

  CONVERG    CPUF1       CMIN         CMAX
 *********  *****   *********   **********
 2.1738E-8   29.16   4.8491E-8   1.3169E-13

  XPRIME       OLDX        DUAL      BBTROOTS  INTERIOR
 ********  *********  **********  ********  ********
```

```
  .27908    3.7353      3.7917E-15    .023915   .27908
  .22977    3.0753      2.7302E-15    .12797    .22977
  .22537    3.0164      2.975E-15     .297      .22537
  .24709    3.3071      1.3284E-9     6         .24709
 3.623E-9   4.8491E-8                                .018679
  .018679   0
```

P H A S E O N E E N D S

P H A S E T W O B E G I N S

```
INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN=1
:><<< NULL LINE ENTERED >>>

      A          B  C
**********       **  *
 1  -1   2  1    10  3
-2   3   1  4    18  6
 4   1  -1  0    15  5
                  0

 ITER  BBTROOTS
 ****  ********
  2      .012915
         .15784
         .3685
        5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 29    ITERATIONS

   CONVERG    CPUF2    CMIN     CMAX
**********  *****  ******  ******
-9.9267E-9   38.62   11.559  11.559

   XPRIME       OLDX        DUAL       BBTROOTS
*********  **********  **********  *********
 .36028     3.7353      -2.4705     1.0017E-5
 .0056739    .058824      .61763      .25442
1.0445E-7   1.0829E-6    1.6764      .68859
 .60993     6.3235       2.0893E-7  5
 .024114    0
```

OK

P H A S E T W O E N D S

```
MANUAL MODE
:_$
:_$
:_$
:_$
:_$
:_$
:_$     EXAMPLE N. 1, ALPHA=1  Q=25
:_$
:_$
```

```
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=1
:>Q=25
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

       A          B
 **********  **
  1  -1   2  1   10
 -2   3   1  4   18
  4   1  -1  0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y=1
:><<< NULL LINE ENTERED >>>

     AUGMENTA          DISCREP   RHS   ARTIFC
 ****************   *******   ***   ******
  1  -1   2  1   9.25    -9.25    10      0
 -2   3   1  4  16.5    -16.5     18      0
  4   1  -1  0  14       -14      15      0
                                         0
                                         1


 ITER   BBTROOTS
 ****   ********
  4       .024767
          .12587
          .30684
         6

RESULTS AFTER  ITER =  5   ITERATIONS

  CONVERG    CPUF1       CMIN          CMAX
 *********  *****  **********  **********
 9.021E-17  6.87    2.0225E-16  1.3044E-10


   XPRIME        OLDX         DUAL      BBTROOTS  INTERIOR
 **********  **********  **********  ********  ********
  .27768      3.7353      3.757E-12    .024722  .27768
  .23364      3.1429      2.7196E-12   .12628   .23364
  .22927      3.0841      2.9278E-12   .29323   .22927
  .24082      3.2394      4.1551E-8    6        .24082
 1.5035E-17   2.0225E-16                        .018585
  .018585     0


     P H A S E     O N E     E N D S
```

```
P H A S E        T W O        B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN=1
:<<<< NULL LINE ENTERED >>>

      A          B   C
**********      **   *
 1  -1   2  1   10   3
-2   3   1  4   18   6
 4   1  -1  0   15   5
                     0


ITER   BBTROOTS
****   *********
 2      .0055169
        .19021
        .45954
    5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

RESULTS AFTER  ITER =  (50)    ITERATIONS

  CONVERG     CPUF2    CMIN       CMAX
**********   *****   *******   *******
-1.1523E-4   66.62   -.11458   -.11348


  XPRIME        OLDX          DUAL        BBTROOTS
*********    *********    *********     **********
4.9758E-5    8.7436E-5    2.3693         2.6318E-5
9.5003E-6    1.6694E-5    -.5924          .20379
-.013082     -.022988     -.8762         4.2085
.87075       1.5301       7.3099E-5     14.53
.14227       0
                  INFEASIBLE
       P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$  WITH ALPHA=1  XPRIME HAS BECOME INFEASIBLE !!!!!
:_$
:_$
:_$
:_$ EXAMPLE N. 1, ALPHA=.9  Q=25
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

P H A S E     O N E     B E G I N S
```

```
 INPUT ALPHA Q
:>ALPHA=.9
:>Q
Q =  25
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

      A          B
 **********   **
  1 -1   2 1   10
 -2   3   1 4   18
  4   1 -1 0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:><<< NULL LINE ENTERED >>>

     AUGMENTA        DISCREP   RHS   ARTIFC
 ***************   *******   ***   ******
  1 -1   2 1  9.25    -9.25    10      0
 -2   3   1 4 16.5    -16.5    18      0
  4   1 -1 0 14       -14      15      0
                                       0
                                       1


 ITER   BBTROOTS
 ****   ********
  4       .0247
          .12454
          .37585
         6

 RESULTS AFTER  ITER =  9   ITERATIONS

  CONVERG    CPUF1      CMIN         CMAX
 *********  *****  *********  **********
 8.0851E-9   12.79  1.8107E-8  5.2923E-13

   XPRIME       OLDX        DUAL      BBTROOTS  INTERIOR
 *********  *********  **********  ********  ********
  .27798     3.7353     1.5242E-14   .024551   .27798
  .23283     3.1286     1.1022E-14   .12663    .23283
  .22845     3.0698     1.1895E-14   .29401    .22845
  .24214     3.2537     2.6501E-9    6         .24214
 1.3475E-9   1.8107E-8                         .018605
  .018605    0


     P H A S E      O N E      E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>
```

```
      A               B    C
**********          **    *
 1  -1   2  1       10    3
-2   3   1  4       18    6
 4   1  -1  0       15    5
                          0


ITER    BBTROOTS
****    *********
 2        .0067617
          .18348
          .43928
       5

RESULTS AFTER  ITER =  11   ITERATIONS

 CONVERG    CPUF2    CMIN     CMAX
*********   *****   ******   ******
1.5523E-9   14.96   11.559   11.559        OK


  XPRIME         OLDX          DUAL          BBTROOTS
*********     *********     **********     *********
 .36028       3.7353       -2.4706        1.0017E-5
 .0056735      .058824       .61764        .25442
3.3953E-9     3.5201E-8     1.6765         .68859
 .60993       6.3235        2.9486E-8   5
 .024113      0


          P H A S E          T W O          E N D S

MANUAL MODE
:_JOURNAL OFF
:_$
:_$
:_$
:_$
:_$      EXAMPLE N. 2, ALPHA=.25  Q=45
:_$
:_$
:_$
:_$
:_MAXSIMPLEX
EXECUTION STARTED
LPMAX(C,A,B,0:PRIMAL=P,DDUAL=D) =   134400
IN LINE 'TABULATE A B C PRIMAL DDUAL CPULP'  TABULATION FAILED+

  A (A 5 BY 11 MATRIX)
ROW 1    1      1      1      1      1      1      1       0      0      0      0
ROW 2    1      2      .5     1      2.5    -.06   -1.05   1      0      0      0
ROW 3    1      3      .5     1      2      -.06   0       -1.05  1      0      0
ROW 4    -.5    2      .5     1      0      -.06   0       0      -1.05  1      0
ROW 5    -.5    1      .5     1      -2     -.06   0       0      0      -1.05  1

  B (A VECTOR WITH 5 COMPONENTS)
 100000 -5000    -5000    -5000    -5000

  C (A VECTOR WITH 11 COMPONENTS)
 3.5    11     4      6      5      1.06   0      0      0      0      1.05

  PRIMAL (A VECTOR WITH 11 COMPONENTS)
```

```
:>KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA 0                                                    - 13 -
:>ALPHA=.5
:>0=30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

       A          B
 **********   **
  1  -1   2  1   10
 -2   3   1  4   18
  4   1  -1  0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ****************
  1  -1   2  1   9.25
 -2   3   1  4  16.5
  4   1  -1  0  14


 DISCREP   RHO   ARTIFC
 *******   ***   ******
  -9.25     10       0
 -16.5      16       0
 -14        15       0
                     0
                     1


 ITER   BBTROOTS
 ****   ********
  4       .022281
          .10468
         2.8982
         6


 RESULTS AFTER  ITER =  28    ITERATIONS

   CONVERG    CPUF1      CMIN        CMAX
 **********   *****   *******   **********
 9.2796E-10   38.03   2.07E-9   2.3997E-16


   XPRIME       OLDX       DUAL       BBTROOTS   INTERIOP
 **********   *******   **********   ********   ********
  .27908      3.7353    6.9095E-18    .023915    .27908
  .22977      3.0753    4.9753E-18    .12797     .22977
  .22537      3.0164    5.4213E-18    .297       .22537
  .24709      3.3071    5.6709E-11    6          .24709
 1.5466E-10   2.07E-9                            .018679
  .018679     0
```

```
P H A S E     O N E     E N D S

P H A S E     T W O     B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
?MIN=1
<<<< NULL LINE ENTERED >>>

     A          B   C
**********     **   *
 1 -1   2 1    10   3
-2  3   1 4    19   4
 4  1  -1 0    15   5
                    6

ITER   BETROOTS
****   ********
 0      .012915
         .15784
        .3685
       5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

RESULTS AFTER  ITER = (50)    ITERATIONS

 CONVERG     CPUFS   CMIN     CMAX
*********    *****   ******   ******
6.7794E-8    69.08   11.559   11.559

  XPRIME      OLDX         DUAL          BETROOTS
*********    *********    **********    *********
 .36025      3.7253       -2.4705        1.0017E-5
 .0056739     .058825      .61762         .25442
3.756E-7     1.8200E-6    1.6764          .68859
 .60993      6.3235       3.5325E-7     5
 .024114     0

      P H A S E        T W O        E N D S

MANUAL MODE
```

```
MANUAL MODE
:_GET LPSIZE
LPSIZE IN LINE 'GET LPSIZE'  COULD NOT BE FOUND
:_JOURNAL OFF
:_$
:_$
:_$
:_$
:_$
:_$ EXAMPLE N. 1      ALPHA=.25  Q=15
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

       A          B
 **********   **
  1 -1   2 1   10
 -2   3   1 4   18
  4   1 -1 0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ****************
  1 -1   2 1   9.25
 -2   3   1 4 16.5
  4   1 -1 0 14


 DISCREP   RHS   ARTIFC
 *******   ***   ******
  -9.25    10       0
 -16.5     18       0
 -14       15       0
                    0
                    1
```

```
 ITER    BBTROOTS
 ****   *********
  4       .018267
          .080181
         6
        11.321

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 34    ITERATIONS

  CONVERG    CPUF1     CMIN        CMAX
 *********  *****  ********  *********
 2.6561E-5  44.89  5.909E-5  7.9094E-8


   XPRIME      OLDX        DUAL     BBTROOTS  INTERIOR
 *********  ********  *********  ********  ********
  .27978     3.7345    2.277E-9    .023521  .27978
  .22785     3.0414    1.6351E-9   .12881   .22785
  .22344     2.9825    1.7929E-9   .29902   .22344
  .25019     3.3396    1.033E-6    6        .25019
 4.4269E-6  5.909E-5                        .018729
  .018729   0


      P H A S E      O N E      E N D S


       P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:>MIN=1
:><<< NULL LINE ENTERED >>>

       A          B   C
 **********   **   *
  1  -1   2  1   10   3
 -2   3   1  4   18   6
  4   1  -1  0   15   5
                    0


 ITER   BBTROOTS
 ****   ********
  2       .017675
          .14313
          .33211
         5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 29    ITERATIONS

  CONVERG    CPUF2    CMIN      CMAX
 *********  *****  ******    ******
 2.8337E-5  38.3    11.563    11.563
```

~ OK

```
   XPRIME        OLDX         DUAL        BBTROOTS
 *********    *********    **********    *********
  .36027      3.7352      -2.4822      1.0168E-5
  .0057137     .059238      .62062      .25439
 4.0175E-5   4.1653E-4    1.681         .68848
  .60986      6.323        1.4691E-6   5
  .024113     0

           P H A S E          T W O           E N D S

MANUAL MODE
:_$
:_$
:_$
:_$  EXAMPLE N. 1 ALPHA=.95  Q=15
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.95
:>Q
Q =  15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0.Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

       A          B
 *********       **
  1 -1  2 1      10
 -2  3  1 4      18
  4  1 -1 0      15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ***************
  1 -1  2 1  9.25
 -2  3  1 4 16.5
  4  1 -1 0 14

 DISCREP  RHS  ARTIFC
 *******  ***  ******
  -9.25   10     0
 -16.5    18     0
 -14      15     0
                 0
                 1

 ITER  BBTROOTS
```

```
****  ********
 4      .02474
        .12536
        .33304
       6

RESULTS AFTER  ITER = (5)   ITERATIONS

 CONVERG     CPUF1      CMIN         CMAX
*********  ******  *********  *********
1.9619E-5  7.0798  4.3955E-5  1.2634E-0


  XPRIME       OLDX        DUAL     BBTROOTS  INTERIOR
*********  *********  *********  ********  ********
 .27783     3.7347     3.6388E-7   .024643  .27783
 .23324     3.1353     2.6329E-7   .12641   .23324
 .22886     3.0765     2.9381E-7   .29521   .22886
 .24147     3.246      1.2976E-5  6         .24147
3.2699E-6  4.3955E-5                        .018598
 .018598   0

     P H A S E     O N E     E N D S

      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>

      A          B  C
**********  **  *
 1  -1   2 1  10  3
-2   3   1 4  18  6
 4   1  -1 0  15  5
                0


ITER   BBTROOTS
****  *********
 2      .0061251
        .18683
        .44934
       5

RESULTS AFTER  ITER = (7)   ITERATIONS

 CONVERG     CPUF2    CMIN     CMAX
*********  ******  ******  ******
6.0426E-6  9.3601  11.559  11.559


  XPRIME       OLDX        DUAL       BBTROOTS
*********  *********  **********  *********
 .36028     3.7352     -2.4707     1.0029E-5
 .0056739    .058824     .61769     .25442
1.7925E-7  1.8584E-6   1.6765      .6886
 .60993     6.3233     2.0513E-6  5
```

OK

```
   .024114    0

          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$   EXAMPLE N. 1 ALPHA=1 Q=15
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1
:>Q
Q =  15
:>>>>> NULL LINE ENTERED >>>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:>>>>> NULL LINE ENTERED >>>>

        A          B
 **********   **
  1 -1   2 1   10
 -2   3   1 4   18
  4   1 -1 0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:>>>>> NULL LINE ENTERED >>>>

     AUGMENTA
 ****************
  1 -1   2 1   9.25
 -2   3   1 4 16.5
  4   1 -1 0 14


 DISCREP   RHS   ARTIFC
 *******   ***   ******
  -9.25     10       0
 -16.5      18       0
 -14        15       0
                     0
                     1


 ITER   BBTROOTS
 ****   ********
  4       .024767
          .12587
          .30684
        6

 RESULTS AFTER  ITER =  (4)    ITERATIONS
```

```
  CONVERG     CPUF1       CMIN         CMAX
*********   ******   *********   *********
1.4958E-6   5.6301   3.3536E-6   8.3759E-4

   XPRIME        OLDX         DUAL      BBTROOTS   INTERIOR
*********   *********   *********   *********   *********
  .27768      3.7352      2.412E-5     .024767   .27768
  .23364      3.1429      1.7449E-5    .12587    .23364
  .22927      3.0841      1.882E-5     .30684    .22927
  .24082      3.2394      1.078E-4     6         .24082
2.4931E-7     3.3536E-6                          .018585
  .018585     0

      P H A S E       O N E       E N D S

       P H A S E         T W O         B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>

      A          B   C
**********   **   *
 1  -1   2  1   10   3
-2   3   1  4   18   6
 4   1  -1  0   15   5
                     0

ITER    BBTROOTS
****   *********
 2       .0055169
         .19021
         .45954
        5

RESULTS AFTER  ITER = (6)    ITERATIONS

 CONVERG     CPUF2    CMIN     CMAX
*********   ******   ******   ******
1.0633E-5   8.1401   11.559   11.559

   XPRIME         OLDX          DUAL        BBTROOTS
**********   **********   **********   *********
  .36028      3.7353       -2.4719      1.0033E-5
  .0056738     .058823       .61799       .25442
2.9233E-12   3.0308E-11     1.677        .68858
  .60993      6.3235       1.8733E-7    5
  .024114     0

          P H A S E         T W O          E N D S

MANUAL MODE
:_$
:_$
```

```
:_$  EXAMPLE N. 1    ALPHA=1.1  Q=15
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1.1
:>Q
Q =  15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

       A          B
 **********   **
  1 -1   2 1   10
 -2  3   1 4   19
  4  1 -1 0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ****************
  1 -1   2 1   9.25
 -2  3   1 4  16.5
  4  1 -1 0  14


 DISCREP   RHS   ARTIFC
 *******   ***   ******
  -9.25    10        0
 -16.5     19        0
 -14       15        0
                     0
                     1


 ITER   BBTROOTS
 ****   ********
  4       .024866
          .12613
          .28608
        6

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
IN LINE 'OLDX=X/((N-1)*X(NP1))'  DIVISION BY ZERO.
** ERROR DETECTED IN LINE 49.00 OF PHASEONE
** CALLED FROM LINE 5.00 OF KARMARKA
ERROR TERMINATES EXECUTION
:>$
:>$
:>$  EXAMPLE N. 1    ALPHA=.5  Q=30
```


OVERFLOW

```
:>$
:>$
:>KARMAPKAR
EXECUTION STARTED
```



```
  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>ALPHA=.5
:>Q=30
:><<< NULL LINE ENTERED >>>

        A          B
 **********   **
  1  -1   2  1   10
 -2   3   1  4   18
  4   1  -1  0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ****************
  1  -1   2  1   9.25
 -2   3   1  4  16.5
  4   1  -1  0  14


 DISCREP   RHS   ARTIFC
 *******   ***   ******
  -9.25     10       0
 -16.5      18       0
 -14        15       0
                     0
                     1

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER   BBTROOTS
 ****   ********
  4       .022281
          .10468
         2.8982
         6


 RESULTS AFTER  ITER =  (28)    ITERATIONS

   CONVERG     CPUF1      CMIN        CMAX
 **********   *****   *******   **********
 9.2796E-10   39.03   2.07E-9   2.3997E-16


   XPRIME        OLDX        DUAL       BBTROOTS   INTERIOR
 **********   *******   **********   ********   ********
  .27908       3.7353   6.9095E-18    .023915    .27908
  .22977       3.0753   4.9753E-18    .12797     .22977
  .22537       3.0164   5.4213E-18    .297       .22537
```

```
  .24709      3.3071    5.6709E-11   6          .24709
 1.5466E-10   2.07E-9                           .018679
  .018679     0
```



```
      P H A S E      O N E      E N D S


       P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>

       A          B  C
 **********      **  *
  1  -1   2 1    10  3
 -2   3   1 4    12  6
  4   1  -1 0    15  5
                      0

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER   BETAROOTS
 ****   *********
  2       .012915
          .15784
          .3685
        5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
NOT ENOUGH ROOM TO LOAD LINKULES.
UNLOAD SOME LINKULES AND TRY AGAIN.
** ERROR DETECTED IN LINE 32.00 OF PHASETWO
** CALLED FROM LINE 6.00 OF KARMARKA
ERROR TERMINATES EXECUTION
:>LINKSTAT
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

                LINKULE STATISTICS

 LINKULE_   COUNT_   SIZE_   LIBRARY_   STATUS_
 ********   ******   *****   ********   *******
 LINKSTAT        2   16383   LINKULES   LOADED
 TABULATE       62   23551   LINKULES   LOADED
 RESTORE         1   21503   LINKULES
 CPUSECON       24   12799   LINKULES
 NOROWS        883   12799   LINKULES
 NOCOLS         32   12799   LINKULES
 DIAGMAT       864   15359   LINKULES
 TRANSPOS     4325   13311   LINKULES
 INVERSE       864   17919   LINKULES
 UMAT          870   13311   LINKULES
```

```
 NORMAL        864    13311  LINKULE8
 SUM           864    13311  LINKULE8
 EIGENVAL       24    40959  LINKULE8
 GET            19    20991  LINKULE8
 HENCEFOR        6    13311  LINKULE8
 KIND           18    12799  LINKULE8
 ELIMEL8         5    13823  LINKULE8
 JOURNAL         2    14847  LINKULE8
 KEPT            3    20991  LINKULE8

:>CHECKPOINT PARI8Q
:>QUIT
 SPACE USED  14 K NOW,  18 K PEAK,  SIZE   100 K
```

```
:>PHASETWO
EXECUTION STARTED

      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>

        A          B   C
 **********    **   *
  1  -1   2  1   10   3
 -2   3   1  4   19   6
  4   1  -1  0   15   5
                      0


 ITER   BBTROOTS
 ****   ********
  2       .012915
          .15784
          .3887
         5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  200    ITERATIONS

  CONVERG     CPUF2    CMIN     CMAX
 *********  ******  ******  *****
 2.1497E-4  273.09   11.187   11.29      ~ OK


   XPRIME       OLDX        DUAL       BBTROOTS
 *********  *********  **********  *********
  .35974     3.5993     -1.8118     1.3373E-5
  .0060222    .060253     .44929      .25711
 5.5484E-4    .0055514   1.4214       .71349
  .60869     6.0901       .0024189  5.0002
  .024987    0


          P H A S E         T W O         E N D S

MANUAL MODE
:_$
:_$
:_$ EXAMPLE N.1  ALPHA=.95  Q=30
:_$
:_$
:_KARMARKAR
EXECUTION STARTED
```

```
  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.95
:>Q
Q =  30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

      A        B
 **********   **
  1 -1  2 1   10
 -2  3  1 4   18
  4  1 -1 0   15

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

     AUGMENTA
 ****************
  1 -1  2 1  9.25
 -2  3  1 4 16.5
  4  1 -1 0 14


 DISCREP   RHS   ARTIFC
 *******   ***   ******
  -9.25    10       0
 -16.5     19       0
 -14       15       0
                    0
                    1


 ITER   BBTROOTS
 ****   ********
  4       .02474
          .12536
          .33304
        6


 RESULTS AFTER  ITER =  9   ITERATIONS

   CONVERG     CPUF1       CMIN          CMAX
 **********   *****   **********   *********
 6.1145E-11   11.84   1.3701E-10   1.233E-16


   XPRIME        OLDX          DUAL       BBTROOTS   INTERIOP
 **********   **********   **********   ********   ********
  .27783       3.7353      3.5512E-18    .024637    .27783
  .23324       3.1358      2.5692E-18    .12645     .23324
  .22886       3.077       2.7694E-18    .29362     .22886
  .24148       3.2466      4.0424E-11    6          .24148
1.0191E-11     1.3701E-10                           .018595
  .018595      0
```

P H A S E   O N E   E N D S

P H A S E   T W O   B E G I N S


```
INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN =  1
:><<< NULL LINE ENTERED >>>

      A          B   C
 **********     **   *
  1 -1   2 1    10   3
 -2  3   1 4    18   6
  4  1  -1 0    15   5
                     0

 ITER   BBTROOTS
 ****   *********
  2      .0061249
         .18683
         .44926
        5

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  119    ITERATIONS

   CONVERG      CPUF2   CMIN    CMAX
 ***********   ******  ******  ******
 -5.0415E-10   158.61  .20944  .20944
```

CONVERGED TO WRONG POINT

```
   XPRIME      OLDX        DUAL        BBTROOTS
 *********   *********   **********   *********
 5.2287E-8   1.8397E-7   -2.828       1.54E-5
  .0099208    .034906     .70701       .18173
 2.7034E-9   9.5121E-9   1.0509       3.3474
  .91903     3.2336      2.6272E-8    5.6447
  .071053    0
```

P H A S E   T W O   E N D S

```
MANUAL MODE
:_SUM(XPRIME)
SUM(XPRIME) =  1
:_JOURNAL OFF
```

EXAMPLE N. 2 A (5x11) Max, Unique solution

			Phase I		Phase II		Total	
	α	q	Iter	CPU	Iter	CPU	Iter	CPU
Simplex	-	-	--	--	--	--	--	.48
Karmarkar	.25	40	111	197.88	85	149.39	196	447.27
	.50	40	50	83.52	39	67.87	89	151.39
	.75	40	29	49.65	27	47.09	56	96.74
	.95	40	converged to wrong point. infeasible					
	.90	30	18	29.94	14	23.18	32	53.12
	.50	30	41	73.28	23	39.13	74	112.41
	.50	50	60	107.44	200	348.16	260	455.60
	.85	50	converged to wrong point. infeasible					

```
:_$
:_$
:_$  EXAMPLE N. 2
:_$
:_$
:_$
:_GET MAXXIMPLEX
MAXXIMPL IN LINE 'GET MAXXIMPLEX'  COULD NOT BE FOUND
:_GET MAXSIMPLEX
:_MAXSIMPLEX
EXECUTION STARTED
LPMAX(C,A,B,0:PRIMAL=P,DDUAL=D) =  134400

                               A
*************************************************************
 1   1 1   1  1   1     1     0     0      0     0
 1   2  .5 1  2.5 -.06 -1.05  1     0      0     0
 1   3  .5 1  2    -.06  0   -1.05  1      0     0
-.5 2  .5 1  0    -.06  0     0    -1.05   1     0
-.5 1  .5 1 -2    -.06  0     0     0    -1.05   1

    B        C      PRIMAL    DDUAL     CPULP
 ******   *****   ******   ******   ******
 100000   3.5     31721    1.6004   .47998
  -5000  11           0    1.5242
  -5000   4           0    1.4516
  -5000   6           0    1.1025
  -5000   5           0    1.05
          1.06        0
          0       68279
          0       34972
          0           0
          0       10960
          1.05    22264
MANUAL MODE
:_$
:_$
:_$
:_$
:_$    EXAMPLE N. 2 , ALPHA=.25  Q=40
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E    O N E    B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=40
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

                               A                             B
*************************************************************   ******
 1   1 1   1  1   1     1     0     0      0     0   100000
 1   2  .5 1  2.5 -.06 -1.05  1     0      0     0    -5000
 1   3  .5 1  2    -.06  0   -1.05  1      0     0    -5000
-.5 2  .5 1  0    -.06  0     0    -1.05   1     0    -5000
```

CAPITAL BUDGETING

SIMPLEX

```
 -.5 1   .5 1 -2    -.06   0       0       0     -1.05 1    -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y=1
:><<< NULL LINE ENTERED >>>
```



```
                                AUGMENTA
*************************************************************
1    1 1    1   1    1       1       0       0       0     0 99999
1    2   .5 1   2.5 -.06  -1.05    1       0       0     0 -5000.6
1    3   .5 1   2    -.06   0      -1.05    1       0     0 -5000.7
-.5  2   .5 1   0    -.06   0       0      -1.05    1     0 -5000.3
-.5  1   .5 1  -2    -.06   0       0       0     -1.05  1 -5000

 DISCREP     RHS    ARTIFC
********  ******  ******
-99999     100000     0
  5000.6    -5000     0
  5000.7    -5000     0
  5000.3    -5000     0
  5000      -5000     0
                      0
                      0
                      0
                      0
                      0
                      0
                      1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6

 ITER      BBTROOTS
 ****  ****************
  4          2.0023E-4
             2.5496E-4
             3.6844E-4
              .0026575
            13
       70986860

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 5 DIMENSION IS 6
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  50   ITERATIONS
```

SELF-CORRECTING

ITERLIM TOO LOW

CONVERG	CPUF1	CMIN	CMAX
*********	*****	*******	******
6.7093E-5	91.02	.082742	.46199

XPRIME	OLDX	DUAL	BBTROOTS	INTERIOR
*********	**********	*********	**********	*********
.035975	576.76	5.1546E-6	5.0734E-5	.035975
.0076562	122.75	4.2076E-6	1.1226E-4	.0076562
.025746	412.77	3.0621E-6	4.2331E-4	.025746
.015163	243.1	1.8894E-6	.0017346	.015163
.017391	278.81	1.5359E-6	.9137	.017391
.10125	1623.3	4.9703E-7	13	.10125
.35749	5731.4			.35749
.23065	3697.8			.23065
.0985	1579.2			.0985
.056122	899.74			.056122
.054047	866.49			.054047
5.161E-6	.082742			5.6704E-6
5.6704E-6	0			

P H A S E O N E E N D S

P H A S E T W O B E G I N S

INPUT IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
1>MIN=-1
1>>>> NULL LINE ENTERED >>>>

A										B	C
**********										******	*****
1	1	1	1	1	1	0	0	0	0	100000	3.5
1	2	.5	1	2.5	-.06	-1.05	1	0	0	-5000	11
1	3	.5	1	2	-.06	0	-1.05	1	0	-5000	4
-.5	2	.5	1	0	-.06	0	0	-1.05	1	-5000	6
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	-5000	5
											1.06
											0
											0
											0
											0
											1.05

ITER	BBTROOTS
****	**********
2	4.5828E-5
	9.2669E-5
	4.1302E-4
	.0017464
	.3058
	12.023

MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY
MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 5 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 5 DIMENSION IS 6

ITERLIM TOO LOW

```
RESULTS AFTER  ITER =  50   ITERATIONS

  CONVERG    CPUF2   CMIN      CMAX
**********   *****   ******   *******
-5.3526E-8   89.09   107258   -108175


  XPRIME        OLDX          DUAL          BBTROOTS
*********    **********    **********    ***********
1.3633E-4      13.148      -1.2684        3.272E-11
1.1765E-5       1.1346     -1.2606        7.8089E-10
 .017775      714.2        -1.2939        3.2874E-9
4.7343E-5       4.5656      -.30479       4.837E-6
1.3281E-5       1.2808      -.87443        .017127
 .98121      94626         -3.4582E-4    12
4.6279E-4      44.631
2.4802E-4      23.918
1.739E-5        1.677
1.7906E-5       1.7269
5.6674E-5       5.4655
9.4267E-7       0


         P H A S E        T W O          E N D S

MANUAL MODE
:_ITER
ITER =  50
:_ITERLIM=200
:_KARMARKAR
EXECUTION STARTED

   P H A S E      O N E       B E G I N S

 INPUT ALPHA Q
:>ALPHA
ALPHA =   .25
:>Q
Q =  40
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:><<< NULL LINE ENTERED >>>

                            A                                   B
*******************************************************    ******
1    1 1   1  1   1     1     0       0      0      0    100000
1    2  .5 1  2.5 -.06 -1.05  1       0      0      0     -5000
1    3  .5 1  2   -.06  0    -1.05    1      0      0     -5000
-.5  2  .5 1  0   -.06  0     0      -1.05   1      0     -5000
-.5  1  .5 1 -2   -.06  0     0       0     -1.05   1     -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:><<< NULL LINE ENTERED >>>

                           AUGMENTA
**********************************************************
1    1 1   1  1   1     1     0       0      0      0 99999
1    2  .5 1  2.5 -.06 -1.05  1       0      0      0 -5000.6
1    3  .5 1  2   -.06  0    -1.05    1      0      0 -5000.7
-.5  2  .5 1  0   -.06  0     0      -1.05   1      0 -5000.3
-.5  1  .5 1 -2   -.06  0     0       0     -1.05   1 -5000
```

RESTART

DISCREP	RHS	ARTIFC
********	******	******
-99999	100000	0
5000.6	-5000	0
5000.7	-5000	0
5000.3	-5000	0
5000	-5000	0
		0
		0
		0
		0
		0
		0
		1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6

ITER	BBTROOTS
****	**********
4	2.0023E-4
	2.5496E-4
	3.6844E-4
	.0026575

13

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 5 DIMENSION IS 6
MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY
MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY
MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY

SELF - CORRECTING

RESULTS AFTER ITER = 111 ITERATIONS

CONVERG	CPUF1	CMIN	CMAX
**********	******	*********	**********
8.9199E-13	197.88	1.2001E-8	-1.6341E-12

XPRIME	OLDX	DUAL	BBTROOTS	INTERIOR
**********	**********	**********	**********	*********
.037611	6578.5	-1.8313E-17	4.771E-5	.037611
.0076104	1331.1	-1.5012E-17	1.0225E-4	.0076104
.026026	4552	-1.1008E-17	3.7521E-4	.026026

```
  .015192       2657.1             -7.1045E-18    .0013494    .015192
  .017844       3121               -6.3127E-18    .0044455    .017844
  .1093         18942               7.184E-15   13            .1093
  .35923        62832                                         .35923
  .22945        40133                                         .22945
  .0945         16529                                         .0945
  .052512        9184.7                                       .052512
  .051723        9046.7                                       .051723
 6.8614E-14        1.2001E-8                                 5.1976E-7
 5.1976E-7         0


      P H A S E       O N E       E N D S


       P H A S E        T W O        B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>ITER
ITER =  111
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

                              A                                      B       C
 *****************************************************************  ******  *****
 1    1 1    1   1    1       1      0      0      0      0  100000    3.5
 1    2  .5 1  2.5 -.06 -1.05   1      0      0      0     -5000   11
 1    3  .5 1  2    -.06  0     -1.05   1      0      0     -5000    4
 -.5 2  .5 1  0    -.06  0      0     -1.05   1      0     -5000    6
 -.5 1  .5 1 -2    -.06  0      0      0     -1.05 1     -5000    5
                                                                    1.06
                                                                    0
                                                                    0
                                                                    0
                                                                    0
                                                                    1.05


 ITER    BBTROOTS
 ****    **********
  2        4.3272E-5
           6.4421E-5
           3.7146E-4
            .001367
            .0047018
         12

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (85)  ITERATIONS

  CONVERG        CPUF2   CMIN     CMAX
 ***********    ******  ******  *******
 -7.9291E-13    149.39  134400  -134400        OK


  XPRIME        OLDX          DUAL        BBTROOTS
 *********   ***********   **********   **********
  .18871     31721         -1.6004      3.5052E-5
```

```
 1.1119E-7            .018691  -1.5242       1.8797E-4
 5.5234E-7            .14327   -1.4516       7.444E-4
 1.9208E-7            .032287  -1.1025        .0016907
 1.1514E-7            .019354  -1.05          .0051625
 6.0099E-7            .10102    4.2327E-9  12
  .40619     69279
  .20905     34972
 4.743E-7             .079728
  .064607    10960
  .13244     22263
 5.4082E-7       0


          P H A S E         T W O         E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$
:_$  EXAMPLE N. 2, ALPHA=.5     Q= 40
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.5
:>Q
Q  =   40
:><<< NULL LINE ENTERED >>>
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:><<< NULL LINE ENTERED >>>

                           A                              B
 **************************************************    ******
 1    1 1   1  1   1     1       0      0      0     0  100000
 1    2  .5 1  2.5 -.06 -1.05    1      0      0     0   -5000
 1    3  .5 1  2   -.06  0      -1.05   1      0     0   -5000
 -.5  2  .5 1  0   -.06  0       0     -1.05   1     0   -5000
 -.5  1  .5 1 -2   -.06  0       0      0     -1.05  1   -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:><<< NULL LINE ENTERED >>>

                          AUGMENTA
 *************************************************************
 1    1 1   1  1   1     1       0      0      0     0 99999
 1    2  .5 1  2.5 -.06 -1.05    1      0      0     0 -5000.6
 1    3  .5 1  2   -.06  0      -1.05   1      0     0 -5000.7
 -.5  2  .5 1  0   -.06  0       0     -1.05   1     0 -5000.3
 -.5  1  .5 1 -2   -.06  0       0      0     -1.05  1 -5000


  DISCREP     RHS    ARTIFC
 ********   ******   ******
```

```
 -99999     100000      0
   5000.6    -5000      0
   5000.7    -5000      0
   5000.3    -5000      0
   5000      -5000      0
                        0
                        0
                        0
                        0
                        0
                        0
                        1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6

 ITER       BBTROOTS
 ****  ****************
  4             2.4011E-4
                2.7976E-4
                3.4493E-4
                 .001495
               13
        38568392

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  50   ITERATIONS

   CONVERG    CPUF1     CMIN        CMAX
**********  *****  ********  **********
6.9686E-13   83.52  9.447E-9  -1.076E-11


   XPRIME         OLDX          DUAL       BBTROOTS     INTERIOR
**********  ************  ***********  **********  *********
 .037208      6557.4       -1.206E-16    4.888E-5    .037208
 .0071708     1263.7       -9.9036E-17   1.0768E-4   .0071708
 .026004      4582.7       -7.3128E-17   3.6843E-4   .026004
 .01477       2602.9       -4.8477E-17    .0013169   .01477
 .016949      2986.9       -3.9347E-17    .0043418   .016949
 .11358      20016          8.5905E-15   13          .11358
 .35214      62060                                   .35214
 .22648      39914                                   .22648
 .09584      16890                                   .09584
 .055546      9789.1                                 .055546
 .054306      9570.6                                 .054306
5.3605E-14       9.447E-9                           5.1584E-7
5.1584E-7        0


     P H A S E      O N E      E N D S

     P H A S E      T W O      B E G I N S
```

Still Correcting

```
INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>
```

						A					B	C
******						**********					******	*****
1	1	1	1	1	1	1	0	0	0	0	100000	3.5
1	2	.5	1	2.5	-.06	-1.05	1	0	0	0	-5000	11
1	3	.5	1	2	-.06	0	-1.05	1	0	0	-5000	4
-.5	2	.5	1	0	-.06	0	0	-1.05	1	0	-5000	6
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	1	-5000	5
												1.06
												0
												0
												0
												0
												1.05

ITER	BBTROOTS
****	**********
2	3.9968E-5
	7.1992E-5
	3.585E-4
	.0013423
	.0048676
	12

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  39   ITERATIONS
```

CONVERG	CPUF2	CMIN	CMAX
*********	*****	******	*******
-4.85E-13	67.87	134401	-134401

OK

XPRIME	OLDX	DUAL	BBTROOTS
*********	**********	**********	**********
.1887	31720	-1.6004	3.505E-5
3.6512E-7	.061375	-1.5242	1.8796E-4
2.7916E-6	.46925	-1.4516	7.444E-4
6.3063E-7	.10601	-1.1025	.0016906
3.7856E-7	.063635	-1.05	.0051625
1.975E-6	.33199	5.3167E-8	12
.40619	68279		
.20805	34973		
1.5639E-6	.26289		
.064605	10860		
.13244	22263		
5.4082E-7	0		

```
          P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$
```

```
:_$ EXAMPLE N. 2,     ALPHA=.75    Q=40
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED
```



```
  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.75
:>Q
Q =  40
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:><<< NULL LINE ENTERED >>>
```

	A									B
1	1	1	1	1	1	0	0	0	0	100000
1	2	.5	1	2.5	-.06	-1.05	1	0	0	-5000
1	3	.5	1	2	-.06	0	-1.05	1	0	-5000
-.5	2	.5	1	0	-.06	0	0	-1.05	1	-5000
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	-5000

```
INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:><<< NULL LINE ENTERED >>>
```

AUGMENTA

1	1	1	1	1	1	0	0	0	0	99999
1	2	.5	1	2.5	-.06	-1.05	1	0	0	-5000.6
1	3	.5	1	2	-.06	0	-1.05	1	0	-5000.7
-.5	2	.5	1	0	-.06	0	0	-1.05	1	-5000.3
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	-5000

DISCREP	RHS	ARTIFC
-99999	100000	0
5000.6	-5000	0
5000.7	-5000	0
5000.3	-5000	0
5000	-5000	0
		0
		0
		0
		0
		0
		1

```
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
```

ITER	BBTROOTS
4	1.9827E-4
	2.8951E-4

```
          4.5479E-4
          8.6028E-4
         13
    18899163

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (29)  ITERATIONS

  CONVERG    CPUF1     CMIN        CMAX
**********  *****  *********  ***********
3.6758E-13  49.63  5.0212E-9  -8.5123E-12

  XPRIME        OLDX           DUAL        BBTROOTS     INTERIOR
**********  ************  ***********  **********  *********
 .036754      6526.9      -9.5431E-17  5.0109E-5   .036754
 .0067723     1202.6      -7.8508E-17  1.1372E-4   .0067723
 .025885      4596.7      -5.8374E-17  3.6248E-4   .025885
 .014306      2540.4      -3.9546E-17   .0012857   .014306
 .01609       2857.2      -2.9735E-17   .0042417   .01609
 .11837       21021        9.2438E-15  13          .11837
 .34523       61306                                .34523
 .22365       39716                                .22365
 .097263      17272                                .097263
 .058643      10414                                .058643
 .057043      10130                                .057043
2.8275E-14      5.0212E-9                         5.1193E-7
5.1193E-7       0

     P H A S E     O N E     E N D S

      P H A S E     T W O     B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:>&lt;&lt;&lt; NULL LINE ENTERED >>>

                           A                               B      C
*****************************************************  ******  *****
1    1 1   1  1   1    1     0     0     0     0   100000   3.5
1    2  .5 1  2.5 -.06 -1.05  1     0     0     0    -5000  11
1    3  .5 1  2   -.06  0    -1.05  1     0     0    -5000   4
-.5  2  .5 1  0   -.06  0     0    -1.05  1     0    -5000   6
-.5  1  .5 1 -2   -.06  0     0     0    -1.05  1    -5000   5
                                                             1.06
                                                             0
                                                             0
                                                             0
                                                             0
                                                             1.05

 ITER    BBTROOTS
 ****   **********
  2      3.6741E-5
         6.038E-5
         3.4386E-4
          .0013081
```

```
           .0050569
        12

 RESULTS AFTER  ITER = (27)  ITERATIONS

   CONVERG      CPUF2   CMIN     CMAX
 ***********   *****   ******   *******
 -3.6677E-13   47.09   134401   -134400                OK.

   XPRIME          OLDX            DUAL         BBTROOTS
 *********     ************     **********     **********
  .1887        31720            -1.6004        3.505E-5
 2.5121E-7           .042227    -1.5242        1.8796E-4
 1.9218E-6           .32304     -1.4516        7.444E-4
 4.339E-7            .072937    -1.1025         .0016906
 2.6036E-7           .043766    -1.05           .0051625
 1.3585E-6           .22836      4.3704E-8     12
  .40619       68279
  .20805       34972
 1.0747E-6           .18065
  .064606      10860
  .13244       22263
 5.4081E-7           0


          P H A S E         T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$
:_$  EXAMPLE N.2,     ALPHA=.95   Q=40
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.95
:>Q
Q =  40
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:><<< NULL LINE ENTERED >>>

                              A                                   B
 *********************************************************   ******
 1    1 1   1  1   1      1     0       0       0     0     100000
 1    2  .5 1  2.5 -.06 -1.05   1       0       0     0      -5000
 1    3  .5 1  2   -.06   0   -1.05     1       0     0      -5000
 -.5  2  .5 1  0   -.06   0     0     -1.05     1     0      -5000
 -.5  1  .5 1 -2   -.06   0     0       0     -1.05   1      -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:><<< NULL LINE ENTERED >>>
```

AUGMENTA

```
*************************************************************
1    1 1    1   1    1      1      0      0      0     0 99999
1    2   .5 1   2.5 -.06  -1.05   1      0      0     0 -5000.6
1    3   .5 1   2   -.06   0     -1.05   1      0     0 -5000.7
-.5  2   .5 1   0   -.06   0      0     -1.05   1     0 -5000.3
-.5  1   .5 1  -2   -.06   0      0      0     -1.05 1 -5000
```

DISCREP	RHS	ARTIFC
********	******	******
-99999	100000	0
5000.6	-5000	0
5000.7	-5000	0
5000.3	-5000	0
5000	-5000	0
		0
		0
		0
		0
		0
		0
		1

```
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 5 DIMENSION IS 6
```

ITER	BBTROOTS
****	**********
4	1.5886E-4
	2.7965E-4
	4.7922E-4
	7.082E-4
	13
9630831	

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
```

RESULTS AFTER ITER = (19) ITERATIONS

CONVERG	CPUF1	CMIN	CMAX
**********	*****	**********	**********
6.4035E-14	35.68	8.8227E-10	-3.1023E-11

XPRIME	OLDX	DUAL	BBTROOTS	INTERIOR
**********	**********	**********	**********	*********
.036337	6508.5	-3.4792E-16	5.1153E-5	.036337
.0064917	1162.8	-2.8671E-16	1.1909E-4	.0064917
.025696	4602.4	-2.1442E-16	3.5821E-4	.025696
.013895	2488.7	-1.4748E-16	.0012603	.013895
.015427	2763.2	-1.0522E-16	.0041519	.015427
.12178	21812	8.1779E-15	13	.12178
.3398	60863			.3398
.22149	39673			.22149
.098496	17642			.098496
.061199	10962			.061199
.059383	10636			.059383

```
 4.9257E-15       8.8227E-10                                    5.0755E-7
 5.0755E-7        0
```

P H A S E O N E E N D S

P H A S E T W O B E G I N S

```
INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>
```

						A					B	C
1	1	1	1	1	1	1	0	0	0	0	100000	2.5
1	2	.5	1	2.5	-.06	-1.05	1	0	0	0	-5000	11
1	3	.5	1	2	-.06	0	-1.05	1	0	0	-5000	4
-.5	2	.5	1	0	-.06	0	0	-1.05	1	0	-5000	6
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	1	-5000	5
												1.06
												0
												0
												0
												0
												1.05

ITER	BBTROOTS
2	3.4254E-5
	5.1854E-5
	3.31E-4
	.0012727
	.0052158
12	

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  153  ITERATIONS
```

CONVERG	CPUF2	CMIN	CMAX
-3.5661E-13	272.42	8.4816E11	-1125423

NO

XPRIME	OLDX	DUAL	BBTROOTS
.015263	3.0994E10	-12.779	2.9938E-6
.0049318	1.0015E10	-11.019	1.6348E-4
.013924	2.8274E10	-9.0421	4.1832E-4
.0090102	1.8297E10	-6.5985	7.6863E-4
.0073149	1.4854E10	-3.8354	.0016985

```
  .034015    6.9073E10    .030399  12
  .28433     5.7739E11
  .22276     4.5236E11
  .15684     3.1849E11
  .13009     2.6414E11
  .12154     2.4681E11
 4.4768E-14  0

          P H A S E        T W O         E N D S

MANUAL MODE
:_$
:_$
:_$
:_$ WITH ALPHA=.95 THE ALGORITHM DID NOT CONVERGE
:_$
:_$
:_$
:_$
:_$ EXAMPLE N.2, ALPHA=.9  Q=30
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.9
:>Q=30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:><<< NULL LINE ENTERED >>>

                              A                                  B
 *****************************************************      ******
 1    1 1    1   1    1      1       0       0       0    0  100000
 1    2  .5  1  2.5  -.06  -1.05     1       0       0    0   -5000
 1    3  .5  1  2    -.06   0      -1.05     1       0    0   -5000
 -.5  2  .5  1  0    -.06   0       0      -1.05     1    0   -5000
 -.5  1  .5  1 -2    -.06   0       0       0      -1.05  1   -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:><<< NULL LINE ENTERED >>>

                               AUGMENTA
 ***************************************************************
 1    1 1    1   1    1      1       0       0       0    0 99999
 1    2  .5  1  2.5  -.06  -1.05     1       0       0    0 -5000.6
 1    3  .5  1  2    -.06   0      -1.05     1       0    0 -5000.7
 -.5  2  .5  1  0    -.06   0       0      -1.05     1    0 -5000.3
 -.5  1  .5  1 -2    -.06   0       0       0      -1.05  1 -5000

  DISCREP     RHS    ARTIFC
 ********   ******   ******
 -99999     100000     0
   5000.6    -5000     0
   5000.7    -5000     0
   5000.3    -5000     0
```

```
   5000      -5000    0
                      0
                      0
                      0
                      0
                      0
                      0
                      1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6

 ITER      BBTROOTS
 ****   ***************
  4           1.6881E-4
              2.842E-4
              4.9302E-4
              7.0674E-4
              13
       11523968

 RESULTS AFTER  ITER = 18  ITERATIONS

  CONVERG    CPUF1     CMIN       CMAX
 ********** *****  *********  *********
 3.7988E-10  29.94  5.2278E-6  2.1428E-7


  XPRIME        OLDX            DUAL        BBTROOTS     INTERIOR
 ********** ************   **********  **********   *********
  .036449     6520.8         2.4029E-12   5.0883E-5     .036449
  .0065579    1173.2         1.9793E-12   1.1769E-4     .0065579
  .025753     4607.2         1.4781E-12   3.5918E-4     .025753
  .014001     2504.8         1.013E-12     .0012662     .014001
  .015591     2789.3         7.3188E-13    .0041719     .015591
  .12098      21643          2.4165E-11   13            .12098
  .34115      61032                                     .34115
  .22202      39720                                     .22202
  .098173     17563                                     .098173
  .060548     10832                                     .060548
  .058781     10516                                     .058781
 2.9222E-11     5.2278E-6                              5.0815E-7
 5.0815E-7      0

    P H A S E     O N E     E N D S


     P H A S E     T W O     B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

                          A                                B       C
*****************************************************   ******  *****
 1  1 1   1  1   1    1    0    0    0    0  100000     3.5
```

```
1    2   .5 1   2.5 -.06 -1.05  1      0      0     0    -5000  11
1    3   .5 1   2   -.06  0     -1.05  1      0     0    -5000   4
-.5  2   .5 1   0   -.06  0      0     -1.05  1     0    -5000   6
-.5  1   .5 1  -2   -.06  0      0      0     -1.05 1    -5000   5
                                                                1.06
                                                                0
                                                                0
                                                                0
                                                                0
                                                                1.05
```



```
ITER    BETROOTS
****   **********
 2      3.4864E-5
        5.3911E-5
        3.3425E-4
          .0012817
          .0051687
       12

RESULTS AFTER  ITER =  14   ITERATIONS

  CONVERG     CPUF2    CMIN      CMAX
**********   *****   ******   *******
-8.0172E-10  23.18   134402   -134388

  XPRIME       OLDX         DUAL       BETROOTS
*********   **********  **********  **********
 .18845     31663       -1.6003      3.475E-5
2.876E-5      4.8322    -1.5241      1.8552E-4
2.226E-4     37.4       -1.4516      7.443E-4
4.9694E-5     8.3494    -1.1022       .0016901
2.9493E-5     4.9552    -1.0499       .0051723
1.5423E-4    25.912      2.1934E-6  12
 .40641     68284
 .20823     34985
1.1858E-4    19.923
 .064375    10816
 .13193     22167
5.4107E-7     0

          P H A S E        T W O        E N D S

MANUAL MODE
:_JOURNAL OFF
```

OK

P H A S E   T W O   E N D S

```
MANUAL MODE
!_A=KEPT(ADATA3)
!_B=KEPT(BDATA3)
!_D=KEPT(DDATA3)
!_$
!_$
!_$
!_$
!_$  EXAMPLE N. 2,  ALPHA=.5  Q=50
!_$
!_$
!_$
!_KARMARKAR
EXECUTION STARTED
```

P H A S E   O N E   B E G I N S

```
 INPUT ALPHA Q
!?ALPHA=.5
!?Q=50
!?<<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
!?Y
Y =  1
!?<<< NULL LINE ENTERED >>>
```

A											B
1	1	1	1	1	1	1	0	0	0	0	100000
1	2	.5	1	2.5	-.06	-1.05	1	0	0	0	-5000
1	3	.5	1	2	-.06	0	-1.05	1	0	0	-5000
-.5	2	.5	1	0	-.06	0	0	-1.05	1	0	-5000
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	1	-5000

```
INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
!?Y
Y =  1
!?<<< NULL LINE ENTERED >>>
```

AUGMENTA

1	1	1	1	1	1	1	0	0	0	0	99999
1	2	.5	1	2.5	-.06	-1.05	1	0	0	0	-5000.6
1	3	.5	1	2	-.06	0	-1.05	1	0	0	-5000.7
-.5	2	.5	1	0	-.06	0	0	-1.05	1	0	-5000.3
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	1	-5000

DISCREP	RHS	ARTIFC
-99999	100000	0
5000.6	-5000	0
5000.7	-5000	0
5000.3	-5000	0
5000	-5000	0
		0
		0
		0
		0
		0

```
                                0
                                1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6

 ITER       BBTROOTS
 ****   ****************
  4           2.4011E-4
              2.7976E-4
              3.4493E-4
               .001490
             13
      [illegible]

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 60   ITERATIONS

  CONVERG     CPUS1      CMIN         CMAX
 *********** ******  **********   ***********
 3.5045E-16  107.44  6.1322E-12   -4.6609E-15


   PRIME          OLDX              DUAL         BBTROOTS     INTERIOR
 **********  ****************  ***********   **********   *********
  .037208       6555.3         -5.224E-20     4.8881E-5   .037208
  .0071708      1263.5         -4.2898E-20    1.0769E-4   .0071708
  .026004       4581.7         -3.1676E-20    3.6845E-4   .026004
  .01477        2602.3         -2.0998E-20     .0013171   .01477
  .016949       2986.2         -1.7043E-20     .0043429   .016949
  .11359       20011            5.5775E-18    13          .11359
  .35214       62046                                      .35214
  .22648       39905                                      .22648
  .095841      16887                                      .095841
  .055547       9787.1                                    .055547
  .054307       9568.6                                    .054307
 3.4804E-17       6.1322E-12                              5.1596E-7
 5.1596E-7        0


      P H A S E     O N E      E N D S


       P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:>ITER
ITER =  60
:><<< NULL LINE ENTERED >>>

                                  A                               B      C
```

```
*****************************************************   ******   *****
1   1 1   1  1   1      1       0       0       0     0  100000   3.5
1   2  .5 1  2.5 -.06  -1.05   1       0       0     0   -5000   11
1   3  .5 1  2    -.06  0      -1.05    1       0     0   -5000    4
-.5 2  .5 1  0    -.06  0       0      -1.05    1     0   -5000    6
-.5 1  .5 1 -2    -.06  0       0       0      -1.05  1   -5000    5
                                                                   1.06
                                                                   0
                                                                   0
                                                                   0
                                                                   0
                                                                   1.05

ITER   BBTROOTS
****   **********
 2       3.9969E-5
         7.1994E-5
         3.5552E-4
          .0013420
          .0048688
        12

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

RESULTS AFTER  ITER =  300   ITERATIONS

  CONVERG      CPUTD   CMIN     CMAX
***********   ******  ******  *******
-3.3215E-11   348.16  134410  -134408


  XPRIME        OLDX         DUAL        BBTROOTS
*********   **********   **********   **********
 .18863     31708         -1.6005      3.5018E-5
8.08E-6         1.3582    -1.5243      1.8771E-4
5.6457E-5       9.4892    -1.4517      7.4435E-4
1.3956E-5       2.3459    -1.1027       .0016904
8.3808E-6       1.4087    -1.0501       .0051629
4.3718E-5       7.3486     8.4074E-7  12
 .40625     68286
 .2081      34979
3.5003E-5       5.8836
 .064548    10850
 .13231     22240
5.4084E-7       0


          P H A S E          T W O          E N D S

MANUAL MODE
:_ITER
```

```
:>#
:>#
:>#
:>#
:>#  EXAMPLE N. 2. ALPHA=.5 Q=30
:>#
:>#
:>KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.5
:>Q
Q =  50
:>Q=30
:>>> NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:>>> NULL LINE ENTERED >>>

                             A                                B
 *********************************************************  ******
 1    1 1   1  1   1     1      0      0      0     0  100000
 1    2  .5 1  2.5 -.06 -1.05   1      0      0     0   -5000
 1    3  .5 1  2   -.06  0     -1.05   1      0     0   -5000
 -.5  2  .5 1  0   -.06  0      0     -1.05   1     0   -5000
 -.5  1  .5 1 -2   -.06  0      0      0     -1.05  1   -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:>>> NULL LINE ENTERED >>>

                              AUGMENTA
 ****************************************************************
 1    1 1   1  1   1     1      0      0      0     0 99999
 1    2  .5 1  2.5 -.06 -1.05   1      0      0     0 -5000.6
 1    3  .5 1  2   -.06  0     -1.05   1      0     0 -5000.7
 -.5  2  .5 1  0   -.06  0      0     -1.05   1     0 -5000.3
 -.5  1  .5 1 -2   -.06  0      0      0     -1.05  1 -5000


  DISCREP     RHS    ARTIFC
  ********  ******   ******
  -99999    100000     0
    5000.6   -5000     0
    5000.7   -5000     0
    5000.3   -5000     0
    5000     -5000     0
                       0
                       0
                       0
                       0
                       0
                       0
                       1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
```

```
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6

 ITER        BBTROOTS
 ****   ***************
  4            2.4011E-4
               2.7976E-4
               3.4493E-4
                .001495
             15
       38569390

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (41)  ITERATIONS

  CONVERG    CPUF1     CMIN        CMAX
 *********   *****   *********   *********
 5.1019E-10  73.28   6.9857E-6   1.1337E-8

  XPRIME         OLDX             DUAL        BBTROOTS     INTERIOR
 ********   *************     **********    **********    *********
  .037209    6558.9           1.2706E-13    4.8879E-5     .037209
  .0071708   1264             1.0434E-13    1.0768E-4     .0071708
  .026004    4583.8           7.7046E-14    3.6842E-4     .026004
  .01477     2603.5           5.1076E-14     .0013168     .01477
  .016949    2987.6           4.1462E-14     .004341      .016949
  .11358    20021             6.351E-12     13            .11358
  .35214    62074                                         .35214
  .22648    39923                                         .22648
  .095839   16894                                         .095839
  .055545    9791.2                                       .055545
  .054306    9572.7                                       .054306
 3.963E-11      6.9857E-6                                 5.1573E-7
 5.1573E-7      0

      P H A S E      O N E      E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

                                   A                               B       C
 ********************************************************    ******  *****
 1    1 1   1  1   1     1      0      0      0     0    100000   3.5
 1    2  .5 1  2.5 -.06 -1.05   1      0      0     0     -5000  11
 1    3  .5 1  2   -.06  0     -1.05   1      0     0     -5000   4
 -.5  2  .5 1  0   -.06  0      0     -1.05   1     0     -5000   6
 -.5  1  .5 1 -2   -.06  0      0      0     -1.05  1     -5000   5
                                                                  1.06
                                                                  0
                                                                  0
                                                                  0
                                                                  0
```

```
ITER   BBTROOTS
****   **********
 2       3.9968E-5
         7.199E-5
         3.5849E-4
          .0013422
          .0048664
       12


RESULTS AFTER  ITER =  23   ITERATIONS

  CONVERG      CPUF2   CMIN     CMAX
***********   *****   ******   *******
-9.2971E-10   39.13   134353   -134345   ~ OK

  XPRIME        OLDX          DUAL       BBTROOTS
*********    **********    *********    **********
 .1883       31612         -1.5997      3.4641E-5
4.7949E-5        8.0496    -1.5237      1.8464E-4
3.9921E-4       67.018     -1.4514      7.4443E-4
8.3196E-5       13.967     -1.1009       .0016906
4.7483E-5        7.9712    -1.0495       .0051785
2.5145E-4       42.213      6.677E-7    12
 .4066       68259
 .20836      34978
1.7903E-4       30.055
 .064189     10776
 .13154      22083
5.4152E-7        0


           P H A S E          T W O           E N D S

MANUAL MODE
:_$
:_$
:_$
:_$   EXAMPLE N. 2    ALPHA=.85  Q=50
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.85
:>Q=50
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

                                   A                              B
*********************************************                  ******
 1   1 1   1  1   1     1     0     0     0     0   100000
 1   2  .5 1  2.5 -.06 -1.05  1     0     0     0    -5000
```

```
 1   3  .5 1  2   -.06  0    -1.05  1     0     0    -5000
 -.5 2  .5 1  0   -.06  0     0    -1.05  1     0    -5000
 -.5 1  .5 1 -2   -.06  0     0     0    -1.05 1    -5000

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
?NY
Y =  1
<<<<< NULL LINE ENTERED >>>

                              AUGMENTA
*******************************************************
1    1 1   1  1   1     1     0     0     0     0 99999
1    2  .5 1  2.5 -.06 -1.05  1     0     0     0 -5000.6
1    3  .5 1  2   -.06  0    -1.05  1     0     0 -5000.7
-.5 2  .5 1  0   -.06  0     0    -1.05  1     0 -5000.3
-.5 1  .5 1 -2   -.06  0     0     0    -1.05 1 -5000


 DISCREP    RHS    ARTIFC
********  ******  ******
-99999    100000    0
  5000.6   -5000    0
  5000.7   -5000    0
  5000.3   -5000    0
  5000     -5000    0
                    0
                    0
                    0
                    0
                    0
                    0
                    1

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 6
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 4 DIMENSION IS 6
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER       BBTROOTS
****   ****************
  4            1.7867E-4
               2.8733E-4
               4.9146E-4
               7.3304E-4
              13
      13682479

RESULTS AFTER  ITER = 127   ITERATIONS

  CONVERG    CPUF1     CMIN         CMAX
**********  *****  **********  ***********
3.2849E-16  49.05  4.5046E-12  -2.4144E-14


  XPRIME          OLDX            DUAL         BBTROOTS     INTERIOR
**********  **************  ***********  **********  *********
 .036553     6516.2         -2.7073E-19   5.0623E-5   .036553
 .0066271    1181.4         -2.229E-19    1.1634E-4   .0066271
```

```
 .025803      4599.8          -1.6623E-19   3.603E-4     .025803
 .014105      2514.5          -1.135E-19     .0012731    .014105
 .015756      2808.8          -9.3051E-20    .0041986    .015756
 .12013      21415             1.3876E-17  17            .12013
 .3425       61057                                       .3425
 .22256      39675                                       .22256
 .097867     17447                                       .097867
 .05991      10680                                       .05991
 .058194     10374                                       .058194
2.5285E-17       4.5046E-12                             5.0995E-7
5.0995E-7        0
```

P H A S E O N E E N D S

P H A S E T W O B E G I N S

```
INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:)MIN
MIN = -1
:)<<< NULL LINE ENTERED >>>
```

						A					B	C
1	1	1	1	1	1	0	0	0	0	100000	3.5	
1	2	.5	1	2.5	-.06	-1.05	1	0	0	0	-5000	11
1	3	.5	1	2	-.06	0	-1.05	1	0	0	-5000	4
-.5	2	.5	1	0	-.06	0	0	-1.05	1	0	-5000	6
-.5	1	.5	1	-2	-.06	0	0	0	-1.05	1	-5000	5
												1.06
												0
												0
												0
												0
												1.05

```
 ITER    RETROOTS
 ****  **********
  3      3.5486E-5
         9.6024E-5
         3.3758E-4
          .0012913
          .0051363
        12

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  200    ITERATIONS
```

```
  CONVERG      CPUFC     CMIN      CMAX
**********   ******   *******   *******
-3.5191E-8   350.05   5947724   -898667

   XPRIME       OLDY       DUAL       BETROOTS
*********    *******   *********    **********
  .014748     216939   -10.213       5.5339E-6
  .0020564     30162    -8.8211      1.5171E-4
  .014813     217894    -7.2517      3.8541E-4
  .0095084    139368    -5.3017      7.6286E-4
  .0076737    112879    -3.1481       .0018443
  .035286     519060      .02486   12
  .27331     4020316
  .21627     3181302
  .15816     2326496
  .13667     2010451
  .13151     1934553
 6.1801E-9         0

          P H A S E          T W O          E N D S

MANUAL MODE
:_ITER
ITER =  200
:_JOURNAL OFF
```

EXAMPLE N. 3 A (3x6) Max, Dual MOS

			Phase I		Phase II		Total	
	α	q	Iter	CPU	Iter	CPU	Iter	CPU
Simplex	-	-	--	--	--	--	--	.40
Karmarkar	.25	15	34	47.31	38	55.25	72	102.56
	.50	15	16	20.86	23	31.06	39	51.92
	.75	17	converged to wrong point. infeasible					
	.75	16	converged to wrong point. infeasible					
	.75	15	8	10.90	15	21.05	23	31.95
	.90	15	6	8.40	13	17.04	19	25.44
	1.00	15	3	4.12	12	17.21	15	21.33
	1.20	15	overflow					
	1.00	20	converged to wrong point. infeasible					
	1.00	10	3	4.35	8	10.82	11	15.17
	1.20	10	overflow					
	.25	20	converged to wrong point. infeasible					
	.90	20	converged to wrong point. infeasible					

```
:>MAXSIMPLEX
EXECUTION STARTED
LPMAX(C,A,B,0:PRIMAL=P,DUAL=D) =  9

        A
 ************
  3  2 -1  1  0  0
 -1  1   5  0  1  0
  1  0   1  0  0  1


 B   C   PRIMAL    DUAL    CPULP
 *   *   ******   ******   *****
 2   4      1     1.7857    .4
 4   1      0     1.3571
 2   5      1     0
     0      0
     0      0
     0      0

MANUAL MODE
:_$
:_$
:_$
:_$
:_$
:_$ EXAMPLE N. 3.   IT EXHIBITS DEGENERACY IN THE PRIMAL WITH MULTIPLE
:_$ DUAL OPTIMAL SOLUTIONS.
:_$
:_$
:_$
:_$ ALPHA=.25    Q=15
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y=1
:><<< NULL LINE ENTERED >>>

        A          B
 ************      *
  3  2 -1  1  0  0  2
 -1  1   5  0  1  0  4
  1  0   1  0  0  1  2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y=1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 ********************
  3  2 -1  1  0  0 1.1667
 -1  1   5  0  1  0 3
  1  0   1  0  0  1 1.5
```

SIMPLEX

```
 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -1.1667     2        0
 -3          4        0
 -1.5        2        0
                      0
                      0
                      0
                      1


 ITER    BETROOTS
 ****   *********
  4      .0011599
         .013353
         .25827
        8


 RESULTS AFTER  ITER =  34    ITERATIONS

  CONVERG   OPUF1       CMIN         CMAX
 ********  *****   *********   *********
 2.841E-5   47.31   1.2379E-5   5.9181E-9


   XPRIME       OLDX         DUAL        BETROOTS   INTERIOR
 *********   *********   **********   *********   ********
  .1445       .50373     6.3749E-11    .0015163   .1445
  .11027      .3844      1.3159E-10    .016342    .11027
  .20827      .72602     2.6322E-9     .079964    .20827
  .12793      .44594     6.1301E-7    8           .12793
  .14029      .48903                              .14029
  .22093      .77014                              .22093
 3.5512E-6   1.2379E-5                            .047811
  .047811    0


     P H A S E       O N E       E N D S


      P H A S E        T W O        B E G I N S

 INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
 :>ITER
 ITER =  34
 :>ITERLIM=100
 :>MIN=-1
 :><<< NULL LINE ENTERED >>>

        A          B  C
 ************      *  *
  3  2 -1  1  0  0  2  4
 -1  1  5  0  1  0  4  1
  1  0  1  0  0  1  2  5
                       0
                       0
                       0

 *MEMORY EXHAUSTED - UNMAPPING LINKULES*
 *UNLOAD LOADED LINKULES TO INCREASE MEMORY*
```

```
 ITER    BBTROOTS
 ****   *********
  2       .0013064
          .020174
          .091307
         7

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  38    ITERATIONS

  CONVERG    CPUF2    CMIN      CMAX
 *********  *****  ******  *******
 -3.024E-5  55.25  8.9982  -8.9985

   XPRIME       OLDX        DUAL       BBTROOTS
 *********  *********  **********  *********
  .46121      .99972     -1.3542     1.9667E-9
 7.6976E-5  1.6685E-4   -1.0695      .096117
  .46126      .99982     -1.006       .27025
 1.5564E-4  3.3736E-4   -1.3509E-7  7
 1.9536E-4  4.2347E-4
 2.1039E-4  4.5604E-4
  .07689     0

          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$  EXAMPLE N. 3.   ALPHA=.5  Q=15
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.5
:>Q
Q =  15
:>Q=16
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************  *
   3 2 -1 1 0 0   2
  -1 1  5 0 1 0   4
   1 0  1 0 0 1   2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
```

OK

```
                    0
                    0
                    0

 ITER    BETROOTS
 ****   **********
  2      .0011034
         .024391
         .10313
        7

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  23   ITERATIONS

  CONVERG    CPUF2    CMIN      CMAX
 **********  *****  ******  *******
 1.2207E-5   31.06   8.9993  -8.9996        OK

   XPRIME       OLDX        DUAL       BETROOTS
 **********  **********  **********  **********
  .46146       .99988     -1.3545     1.2541E-10
 1.5752E-5   3.4132E-5    -1.0697      .096229
  .46149       .99995     -1.006       .27051
 3.2216E-5   6.9804E-5     1.2508E-7  7
 4.0699E-5   8.8195E-5
 4.3417E-5   9.4076E-5
  .076919    0

          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$   EXAMPLE N. 3.     ALPHA=.75     Q=17
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E      O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=.75
:>Q=17
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************  *
  3  2 -1  1  0  0   2
 -1  1  5  0  1  0   4
  1  0  1  0  0  1   2
```

```
INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

       AUGMENTA
 *******************
  3 2 -1 1 0 0 1.1667
 -1 1  5 0 1 0 3
  1 0  1 0 0 1 1.5


 DISCREP  RHS  ARTIFC
 *******  ***  ******
 -1.1667   2     0
 -3        4     0
 -1.5      2     0
                 0
                 0
                 0
                 1


 ITER  BBTROOTS
 ****  ********
  4     .001457
        .016095
        .084991
       8


 RESULTS AFTER  ITER = (8)  ITERATIONS

  CONVERG    CPUF1     CMIN       CMAX
 *********  *****  *********  *********
 5.3305E-6  12.19  2.3368E-6  2.1688E-9


   XPRIME      OLDX        DUAL        BBTROOTS   INTERIOR
 *********  *********  **********  *********  ********
  .14409     .50534    2.2437E-11   .0014899   .14409
  .10716     .37581    4.9327E-11   .016148    .10716
  .20653     .72431    9.6332E-10   .078893    .20653
  .13021     .45665    3.6885E-7    8          .13021
  .14483     .50792                            .14483
  .21965     .77032                            .21965
 6.6632E-7  2.3368E-6                          .047524
  .047524    0


     P H A S E     O N E     E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

       A         B  C
 ************    *  *
  3 2 -1 1 0 0   2  4
```

```
-1 1   5 0 1 0   4   1
 1 0   1 0 0 1   2   5
                     0
                     0
                     0
```



```
 ITER    BBTROOTS
 ****    *********
  2      9.1654E-4
          .029099
          .1159
        7
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
```

```
 RESULTS AFTER  ITER =  81    ITERATIONS

   CONVERG     CPUF2    CMIN     CMAX
**********  ******  *****  *******
-2.7042E-6   112.12  98118  -52.207
```

CONVERGED TO WRONG POINT

```
   XPRIME      OLDX       DUAL      BBTROOTS
*********  *******  *********  *********
 .032786     2986.8  -12.869    2.3325E-4
 .034173     3113.1   -3.4076     .0012439
 .18235     16612     -6.4188     .0413
 .073115     6660.7     .22894  7.0116
 .47226     43022
 .20532     18704
1.8295E-6       0
```

```
          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_D

  D (A 7 BY 7 MATRIX)
  .16667  0        0        0        0        0        0
  0       .16667   0        0        0        0        0
  0       0        .16667   0        0        0        0
  0       0        0        .16667   0        0        0
  0       0        0        0        .16667   0        0
  0       0        0        0        0        .16667   0
  0       0        0        0        0        0        1

:_$
:_$
```

```
:_$
:_$
:_$
:_$  IT DID NOT CONVERGE WITH
:_ALPHA
ALPHA =   .75
:_Q
Q =  17
:_$
:_$
:_$
:_$ EXAMPLE N. 3. ALPHA=.75  Q=16
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA
ALPHA =   .75
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Q=16
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************  *
  3  2 -1  1  0  0   2
 -1  1   5  0  1  0   4
  1  0   1  0  0  1   2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

       AUGMENTA
 ********************
  3  2 -1  1  0  0 1.1667
 -1  1   5  0  1  0 3
  1  0   1  0  0  1 1.5


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -1.1667     2       0
 -3          4       0
 -1.5        2       0
                     0
                     0
                     0
                     1


 ITER   BBTROOTS
 ****   ********
  4       .001457
          .016095
```

```
      .084991
     8

RESULTS AFTER  ITER = (9)   ITERATIONS

 CONVERG   CPUF1     CMIN       CMAX
*********  *****  *********  *********
5.3305E-6  12.14  2.3368E-6  2.1688E-9


  XPRIME      OLDX        DUAL       BBTROOTS  INTERIOR
*********  *********  **********  *********  ********
 .14409     .50534    2.2437E-11   .0014899  .14409
 .10716     .37581    4.9327E-11   .016148   .10716
 .20653     .72431    9.6332E-10   .078893   .20653
 .13021     .45665    3.6885E-7   8          .13021
 .14483     .50792                           .14483
 .21965     .77032                           .21965
6.6632E-7  2.3368E-6                         .047524
 .047524   0


     P H A S E     O N E     E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

       A         B  C
************     *  *
 3 2 -1 1 0 0   2  4
-1 1  5 0 1 0   4  1
 1 0  1 0 0 1   2  5
                   0
                   0
                   0


 ITER   BBTROOTS
 ****  *********
  2    9.1654E-4
        .029099
        .1159
       7

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (74)   ITERATIONS
```

```
   CONVERG      CPUF2     CMIN       CMAX
**********   ******   ******   *******
-1.1343E-5   100.74   8201.9   -53.146
```

CONVERGED TO WRONG POINT

```
   XPRIME       OLDX        DUAL       BITROOTS
*********   *******   *********   *********
 .034996      280.23   -13.14      2.0681E-4
 .02996       239.9     -3.4753     .0012643
 .17087      1368.2     -6.4833     .036769
 .062097      497.23      .22517   7.0109
 .49871      3993.4
 .20334      1628.2
2.0814E-5       0
```

P H A S E T W O E N D S

```
MANUAL MODE
:_$
:_$
:_$
:_$  NO GOOD
:_$
:_$
:_$
:_$  EXAMPLE N. 3.   ALPHA=.75   Q=15
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E   O N E   B E G I N S

 INPUT ALPHA Q
:>ALPHA
ALPHA =  .75
:>Q=15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0.Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 **************   *
  3  2 -1  1  0  0   2
 -1  1  5  0  1  0   4
  1  0  1  0  0  1   2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 ********************
  3  2 -1  1  0  0 1.1667
 -1  1  5  0  1  0 3
  1  0  1  0  0  1 1.5
```

```
DISCREP  RHS  ARTIFC
*******  ***  ******
-1.1667   2     0
-3        4     0
-1.5      2     0
                0
                0
                0
                1


ITER  BBTROOTS
****  ********
 4      .001457
        .016095
        .084991
       8

RESULTS AFTER  ITER = 8   ITERATIONS

 CONVERG    CPUF1      CMIN        CMAX
*********  *****  *********  *********
2.3607E-5  10.9   1.0348E-5  4.2528E-8

  XPRIME       OLDX        DUAL       BBTROOTS   INTERIOR
*********  *********  **********  *********  ********
 .14409      .50533    4.3793E-10   .0014898   .14409
 .10716      .3758     9.6666E-10   .016148    .10716
 .20653      .72429    1.8893E-8    .078904    .20653
 .13021      .45664    1.6335E-6   8           .13021
 .14483      .50791                            .14483
 .21965      .77029                            .21965
2.9508E-6  1.0348E-5                           .047525
 .047525    0

     P H A S E     O N E     E N D S


     P H A S E     T W O     B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

      A          B  C
*************    *  *
 3 2 -1 1 0 0    2  4
-1 1  5 0 1 0    4  1
 1 0  1 0 0 1    2  5
                    0
                    0
                    0


ITER   BBTROOTS
****   *********
 2     9.1654E-4
        .029099
        .1159
```

7


```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  15   ITERATIONS

   CONVERG    CPUF2   CMIN      CMAX
 **********  *****  ******  *******
 -2.6347E-5  21.05  8.9995  -8.9994        OK

   XPRIME       OLDX        DUAL        BBTROOTS
 *********   *********   **********   **********
  .46145      .99992     -1.3541      2.7714E-10
 1.9068E-5   4.1318E-5   -1.0694       .09621
  .46147      .99996     -1.0067       .27047
 3.9066E-5   8.4651E-5   -2.8186E-8   7
 4.9403E-5   1.0705E-4
 5.2586E-5   1.1395E-4
  .076915    0


            P H A S E          T W O           E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$  EXAMPLE N.3      ALPHA=.9   Q=15
:_$
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.9
:>Q
Q =  15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A           B
 ************     *
  3 2 -1 1 0 0    2
 -1 1  5 0 1 0    4
  1 0  1 0 0 1    2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

       AUGMENTA
 ******************
```

```
 3  2 -1  1  0  0  1.1667
-1  1  5  0  1  0  3
 1  0  1  0  0  1  1.5


DISCREP   RHS   ARTIFC
*******   ***   ******
-1.1667     2        0
-3          4        0
-1.5        2        0
                     0
                     0
                     0
                     1


ITER    BETROOTS
****   *********
 4      .0014746
        .016076
        .079404
       8

RESULTS AFTER  ITER = (6)   ITERATIONS

 CONVERG    CPUF1      CMIN        CMAX
*********  *****  *********  *********
4.4787E-6    8.4  1.9676E-6  9.9858E-9

  XPRIME       OLDX        DUAL       BETROOTS  INTERIOF
*********  *********  **********  *********  ********
 .14397      .50602    1.0104E-10   .0014798  .14397
 .10598      .37246    2.285E-10    .016082   .10598
 .20592      .72375    4.4349E-9    .078518   .20592
 .13109      .46075    7.8978E-7    8         .13109
 .14647      .51478                          .14647
 .21914      .77022                          .21914
5.5984E-7  1.9676E-6                         .047421
 .047421    0


     P H A S E      O N E      E N D S


      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A          B  C
************      *  *
 3  2 -1  1  0  0  2  4
-1  1  5  0  1  0  4  1
 1  0  1  0  0  1  2  5
                     0
                     0
                     0
```

```
 ITER    BBTROOTS
 ****   *********
  2     8.1236E-4
          .032161
          .12406
        7

 RESULTS AFTER  ITER =  13    ITERATIONS

  CONVERG    CPUF2    CMIN      CMAX
 *********  *****  ******  *******
 4.0758E-6  17.04   8.9994  -8.9996

   XPRIME       OLDX        DUAL       BBTROOTS
 *********  *********  **********  **********
  .46149      .99991    -1.3546    1.5796E-10
1.2677E-5   2.7468E-5   -1.0697     .096224
 .46149      .99994    -1.0057      .2705
2.5998E-5   5.6331E-5    7.7549E-7  7
3.2906E-5   7.13E-5
3.5021E-5   7.5881E-5
 .07692     0

          P H A S E        T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$    EXAMPLE N. 3.    ALPHA=1  Q=15
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1
:>Q
Q =  15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************  *
  3 2 -1 1 0 0  2
 -1 1  5 0 1 0  4
  1 0  1 0 0 1  2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>
```

```
      AUGMENTA
**********************
 3  2  -1  1  0  0  1.1667
-1  1   5  0  1  0  3
 1  0   1  0  0  1  1.5

DISCREP   RHS   ARTIFC
*******   ***   ******
-1.1667     2        0
-3          4        0
-1.5        2        0
                     0
                     0
                     0
                     1

RESULTS AFTER  ITER =  3    ITERATIONS

 CONVERG    CPUF1      CMIN        CMAX
*********  *****  *********  ********
1.7943E-5   4.12   7.8955E-6  .0020376

  XPRIME       OLDX        DUAL       BBTROOTS   INTERIOR
*********  *********  **********  *********  ********
 .14388      .50649    -8.9782E-6   .0014533  .14388
 .10511      .37001     3.8398E-5   .016008   .10511
 .20547      .7233      9.5101E-4   .091647   .20547
 .13175      .46361     3.667E-4    0         .13175
 .14767      .51982                           .14767
 .21978      .77015                           .21978
2.2429E-6   7.8955E-6                         .047345
 .047345    0

     P H A S E      O N E      E N D S

      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A          B  C
**************     *  *
 3  2  -1  1  0  0  2  4
-1  1   5  0  1  0  4  1
 1  0   1  0  0  1  2  5
                      0
                      0
                      0

 ITER    BBTROOTS
 ****   *********
  2     7.4629E-4
         .034301
         .1297
        7
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  12   ITERATIONS

  CONVERG   CPUF2   CMIN     CMAX
 *********  *****  ******  *******
 8.0924E-6  17.21  8.9994  -8.9997        OK

   XPRIME       OLDX        DUAL       EBTROOTS
 *********  *********  **********  *********
  .4615       .99993   -1.354      1.051E-10
 9.4966E-6  2.0576E-5  -1.0694      .096232
  .4615       .99993   -1.0071      .27052
 1.9478E-5  4.2202E-5   2.9068E-8  ?
 2.4659E-5  5.3428E-5
 2.6202E-5  5.6771E-5
  .076922    0


            P H A S E        T W O        E N D S

MANUAL MODE
:_#
:_#
:_#
:_#
:_#   EXAMPLE  N.3.    ALPHA=1.2    Q=15
:_#
:_#
:_#
:_KARMARKAR
EXECUTION STARTED

  P H A S E    O N E    B E G I N S

 INPUT ALPHA Q
:>ALPHA=1.2
:>Q
Q =  15
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

           A          B
 *************   *
  3 2 -1 1 0 0   2
 -1 1  5 0 1 0   4
  1 0  1 0 0 1   2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 *******************
  3 2 -1 1 0 0 1.1667
 -1 1  5 0 1 0 3
```

```
 1 0  1 0 0 1 1.5

 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -1.1667     2        0
 -3          4        0
 -1.5        2        0
                      0
                      0
                      0
                      1


 ITER    BETROOTS
 ****   *********
  4      .0015085
         .013916
         .070634
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
IN LINE 'OLDX=X/((N-1)*X(NP1))'  DIVISION BY ZERO.
** ERROR DETECTED IN LINE 49.00 OF PHASEONE
** CALLED FROM LINE 5.00 OF KARMARKA
ERROR TERMINATES EXECUTION
:>$
:>$
:>$
:>$
:>$
:>$    EXAMPLE N. 3    ALPHA=1    Q=20
:>$
:>$
:>$
:>KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1
:>Q=20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************      *
  3 2 -1 1 0 0     2
 -1 1  5 0 1 0     4
  1 0  1 0 0 1     2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>
```


OVERFLOW

```
        AUGMENTA
*********************
 3  2 -1  1  0  0 1.1667
-1  1  5  0  1  0 3
 1  0  1  0  0  1 1.5

DISCREP   RHS   ARTIFC
*******   ***   ******
-1.1667     2       0
-3          4       0
-1.5        2       0
                    0
                    0
                    0
                    1

ITER    BBTROOTS
****   *********
 4      .0014726
        .016032
        .078234
       8

RESULTS AFTER  ITER =  4   ITERATIONS

  CONVERG    CPUF1      CMIN          CMAX
**********  *****  **********  *********
8.4577E-15   5.78   3.7217E-15  1.2626E-9

  XPRIME        OLDX          DUAL       BBTROOTS  INTERIOR
**********  **********  **********  *********  ********
 .14388       .50649     1.2619E-11   .0014726  .14388
 .10511       .37002     2.9039E-11   .016032   .10511
 .20547       .72333     5.6059E-10   .078234   .20547
 .13175       .46382     2.8036E-7    8         .13175
 .14767       .51983                            .14767
 .21878       .77018                            .21878
1.0572E-15  3.7217E-15                          .047344
 .047344     0

    P H A S E      O N E      E N D S

     P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

       A          B  C
************      *  *
 3  2 -1  1  0  0  2  4
-1  1  5  0  1  0  4  1
 1  0  1  0  0  1  2  5
                    0
                    0
                    0
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER   EIGROOTS
 ****   ********
  2     7.463E-4
          .0343
          .1297
        7

---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  37    ITERATIONS

   CONVERG    CPUF2     CMIN     CMAX
**********  *****  *******  ******
-9.4396E-8   53.87  1988811  -30.51

   XPRIME      OLIX      DUAL      EIGROOTS
*********  *******  ********  *********
  .04837     164825  -5.6469   6.2904E-4
  .054391    185342  -2.8853    .0017678
  .067154    228834  -3.8372    .013373
  .13813     470694     .16283  7.0053
  .44379    1512260
  .24816     845620
 4.8911E-8        0

          P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$     EXAMPLE N. 3.  ALPHA=1    Q=10
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA
ALPHA =  1
:>Q=10
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>
```

CONVERGED TO WRONG POINT

```
        A          B
 ************  *
  3  2 -1  1  0  0   2
 -1  1   5  0  1  0   4
  1  0   1  0  0  1   2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 ********************
  3  2 -1  1  0  0 1.1667
 -1  1   5  0  1  0 3
  1  0   1  0  0  1 1.5


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -1.1667     2       0
 -3          4       0
 -1.5        2       0
                     0
                     0
                     0
                     1

 RESULTS AFTER  ITER =  3   ITERATIONS

  CONVERG    CPUF1      CMIN        CMAX
 *********  *****  *********  ********
 1.7943E-5   4.35   7.8955E-6   .0020376

   XPRIME       OLDX        DUAL       BRTROOTS   INTERIOR
 *********  *********  **********  *********  ********
  .14388      .50648    -8.9782E-6   .0014533  .14388
  .10511      .37001     3.8398E-5   .016008   .10511
  .20547      .7233      9.5101E-4   .081647   .20547
  .13175      .46381     3.667E-4    8         .13175
  .14767      .51982                           .14767
  .21878      .77015                           .21878
 2.2429E-6   7.8955E-6                         .047345
  .047345    0


     P H A S E      O N E      E N D S


      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A          B  C
 ************  *  *
  3  2 -1  1  0  0   2  4
 -1  1   5  0  1  0   4  1
```

```
 1 0  1 0 0 1  2  5
                  0
                  0
                  0

ITER    PBTROOTS
****   **********
 2     7.4629E-4
        .034301
        .1297
       7

RESULTS AFTER  ITER =  8   ITERATIONS

   CONVERG     CPUF2    CMIN      CMAX
**********   *****   ******   *******
-5.7501E-4   10.82   8.9938   -8.9907

   XPRIME        OLDX         DUAL        PBTROOTS
**********   **********   **********   **********
  .46044       .99906      -1.3532      7.5299E-8
2.551E-4     5.5351E-4     -1.0688       .09534
  .46061       .99941      -1.0046       .26844
5.2184E-4     .0011323    -3.2086E-7    7
6.5787E-4     .0014274
7.0294E-4     .0015252
  .076813    0

          P H A S E          T W O          E N D S

MANUAL MODE
:_<<< NULL LINE ENTERED >>>
:_$
:_$
:_$
:_$    EXAMPLE N. 3.    ALPHA=1.2    Q=10
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1.2
:>Q
Q =  10
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        A          B
 ************   *
  3 2 -1 1 0 0   2
 -1 1  5 0 1 0   4
```

```
  1 0  1 0 0 1  2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 ********************
  3 2 -1 1 0 0 1.1667
 -1 1  5 0 1 0 3
  1 0  1 0 0 1 1.5


 DISCREP  RHS  ARTIFC
 *******  ***  ******
 -1.1667   2      0
 -3        4      0
 -1.5      2      0
                  0
                  0
                  0
                  1


 ITER   BBTROOTS
 ****  *********
  4     .0015085
        .015916
        .070634
       8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
IN LINE 'OLDX=X/((N-1)*X(NP1))'  DIVISION BY ZERO.
** ERROR DETECTED IN LINE 49.00 OF PHASEONE
** CALLED FROM LINE 5.00 OF KARMARKA
ERROR TERMINATES EXECUTION
:>$
:>$
:>$
:>JOURNAL OFF
```

OVERFLOW

```
MANUAL MODE
LA=LEFT(ADATAA)
LB=LEFT(BDATAA)
LC=LEFT(CDATAA)
LKARMARKAR
EXECUTION STARTED

 P H A S E    O N E    B E G I N S

 INPUT ALPHA.C
  ALPHA=.05
```

```
([illegible])
<<<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
<<<< NULL LINE ENTERED >>>

        A              B
 *************         *
  3  2  -1  1  0  0    2
 -1  1   5  0  1  0    4
  1  0   1  0  0  1    2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
<<<< NULL LINE ENTERED >>>

        AUGMENTA
 *******************
  3  2  -1  1  0  0  1.1667
 -1  1   5  0  1  0  3
  1  0   1  0  0  1  1.5


 DIBCREF   RHS  ARTIFC
 *******   ***  ******
 -1.1667    2     0
 -3         4     0
 -1.5       2     0
                  0
                  0
                  0
                  1


 ITER    BBTROOTS
 ****   *********
  4       .0011599
          .013353
          .25627
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  45    ITERATIONS

  CONVERG    CPUF1      CMIN        CMAX
 *********   *****   *********   **********
 8.1564E-7   63.76   3.5543E-7   4.8785E-12


  XPRIME       OLDX        DUAL        BBTROOTS   INTERIOP
 *********   *********   **********   *********   ********
  .1445       .50376     5.2659E-14   .0015163    .1445
  .11027      .38441     1.0849E-13   .016342     .11027
  .20827      .72606     2.1696E-12   .079958     .20827
  .12793      .44596     1.7599E-8   8            .12793
  .14029      .48905                              .14029
  .22093      .77018                              .22093
 1.0196E-7   3.5543E-7                            .047809
  .047809     0
```

```
        P H A S E        O N E        E N D S

          P H A S E        T W O        B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:>>>> NULL LINE ENTERED >>>

          A           B   C
 *************        *   *
  3  2 -1  1  0  0    2   4
 -1  1  5  0  1  0    4   1
  1  0  1  0  0  1    2   5
                          0
                          0
                          0


  ITER    BBTROOTS
  ****   *********
   2      .0013064
          .020174
          .091307
        ?

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  200     ITERATIONS

  CONVERG   CPUFO   CMIN      CMAX
 ********  ******  ******  *******
 -.001007  285.96  23.378  -17.039


  XPRIME     OLDX       DUAL       BETROOTS
 ********   ******   *********   *********
 [illegible] 2.1521  -2.9014       .0015762
 [illegible] 1.6337  -1.7889       .002416
 [illegible] 2.6271  -2.0303       .016564
 .17091     3.6665     .077593   7.0038
 [illegible] 5.333
 .23045     4.9707
 [illegible] 0


           P H A S E          T W O           E N D S

MANUAL MODE
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] EXAMPLE N. 3.  ALPHA=.9  Q=20
[illegible]
[illegible]
[illegible]
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         A            B
 *************    *
  3 2 -1 1 0 0    2
 -1 1  5 0 1 0    4
  1 0  1 0 0 1    2

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         AUGMENTA
 ********************
  3 2 -1 1 0 0 1.1667
 -1 1  5 0 1 0 3
```

```
 1 0  1 0 0 1 1.5

DISCREP   RHS   ARTIFC
*******   ***   ******
-1.1667    2      0
-3         4      0
-1.5       2      0
                  0
                  0
                  0
                  1

ITER    BETROOTS
****   *********
 4      .0011599
        .013352
        .25627
       0

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

RESULTS AFTER  ITER =  45     ITERATIONS

 CONVERG   CPUF1      CMIN        CMAX
*********  *****  *********  **********
3.1564E-7  59.4   3.5543E-7  4.9785E-12

  XPRIME       OLDX        DUAL        BETROOTS   INTERIOR
*********  *********  ***********  *********  ********
 .1445       .50376    5.2659E-14   .0015163   .1445
 .11027      .38441    1.0849E-13   .016342    .11027
 .20927      .72606    2.1696E-12   .079958    .20927
 .12793      .44596    1.7599E-8   8           .12793
 .14029      .48905                            .14029
 .22093      .77013                            .22093
1.0176E-7  3.5543E-7                           .047809
 .047809    0


      P H A S E       O N E       E N D S


       P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A           B  C
************        *  *
 3 2 -1 1 0 0       2  4
-1 1  5 0 1 0       4  1
 1 0  1 0 0 1       2  5
                       0
                       0
                       0
```

```
 ITER   BBTROOTS
 ****   *********
  2      .0013064
         .020174
         .091303
        ?

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
---WARNING: INVERSE OF BBB MAY NOT BE SIGNIFICANT
---MATRIX RANK IS APPROXIMATELY 3 DIMENSION IS 4
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  200    ITERATIONS

  CONVERG   CPUF2   CMIN     CMAX
 ********  ******  ******  *******
 -.001007  283.59  28.378  -17.039

  XPRIME    OLDX     DUAL       BBTROOTS
 ********  ******  *********  *********
 .099772   2.1521  -2.9014     .0015762
 .075741   1.6337  -1.7689     .002416
 .16816    3.6271  -2.0803     .016564
 .17091    3.6865    .077593  7.0038
 .24724    5.333
 .23045    4.9707
 .0077269  0
```

EXAMPLE N. 4 A (3x7) Max, Primal MOS

			Phase I		Phase II		Total	
	α	q	Iter	CPU	Iter	CPU	Iter	CPU
Simplex	-	-	--	--	--	--	--	.42
Karmarkar	.25	10	29	41.46	14	21.04	43	50.50
	.25	15	40	53.77	31	44.17	71	97.94
	.25	20	51	69.85	48	69.96	99	139.81
	.50	20	23	29.90	26	38.38	49	68.28
	.75	20	13	19.08	17	23.96	30	43.04
	.90	20	10	15.24	15	21.55	25	36.29
	1.00	20	7	10.77	13	19.46	20	30.23
	1.10	20			infeasible			
	.25	30	72	99.61	80	113.37	152	212.98
	.50	30	32	43.56	42	59.39	74	102.95
	.75	30	18	23.70	28	41.20	46	64.90
	.90	30	13	17.65	23	33.16	36	50.81
	.50	40	41	53.53	200	291.32	241	344.85

```
:>MAXSIMPLEX
EXECUTION STARTED
LPMAX(C,A,B,0:PRIMAL=P,DUAL=D) =   4.3636

          A
 ***************
 3 2   1 4 1 0 0
 2 1   5 4 0 1 0
 1 3  -2 4 0 0 1


 B       C       PRIMAL     DUAL      CPULP
 *   *******   ********   *******   *******
 6   2.4091    0          0         .41998
 4   1.7727     .47059    1.0909
 0   5          .70588     .22727
     2         0
     0         4.3529
     0         0
     0         0
```

SIMPLEX

```
MANUAL MODE
:_$
:_$
:_$
:_$    EXAMPLE N. 4. ALPHA=.25  Q=10
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E      O N E       B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=10
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0.Y
:>Y=1
:><<< NULL LINE ENTERED >>>

          A           B
 ***************   *
 3 2   1 4 1 0 0   6
 2 1   5 4 0 1 0   4
 1 3  -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y=1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
```

```
                    0
                    0
                    0
                    1

ITER    BBTROOTS
****   *********
 4      .0046172
        .011794
        .63723
       9

RESULTS AFTER  ITER =  29     ITERATIONS

 CONVERG    CPUF1      CMIN        CMAX
*********  *****  *********  *********
7.7449E-4   41.46  5.0812E-4  4.3942E-4


  XPRIME       OLDX        DUAL       BBTROOTS  INTERIOR
*********  *********  **********  *********  ********
 .045639     .26948    4.6383E-6  4.8898E-4  .045639
 .017712     .10458   -5.8589E-6   .0056072  .017712
 .091834     .54225   -2.619E-5    .040622   .091834
 .011114     .065623   1.3157E-5  9          .011114
 .70485     4.1619                           .70485
 .063529     .37511                          .063529
 .041041     .24233                          .041041
8.6054E-5  5.0812E-4                         .024194
 .024194    0

     P H A S E      O N E      E N D S

      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>ITER
ITER =  29
:>ITERLIM=100
:>MIN=-1
:><<< NULL LINE ENTERED >>>

          A          B      C
**************  *  ******
3 2  1 4 1 0 0   6  2.4091
2 1  5 4 0 1 0   4  1.7727
1 3 -2 4 0 0 1   0  5
                    2
                    0
                    0
                    0


 ITER    BBTROOTS
 ****   *********
  2     5.1759E-4
         .0058435
         .042711
        8
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (14)   ITERATIONS

   CONVERG    CPUF2   CMIN    CMAX
 **********  *****  *****  *******
 -9.5541E-4  21.04  4.314  -4.3168        ~OK

  XPRIME       OLDX        DUAL        BETROOTS
 ********   *********  **********  *********
 .13976      .66612      .003436   8.2001E-4
 .019193     .091478   -1.0844      .0065214
 .10644      .50732     -.22057     .060421
 .0010991    .0052384  -1.3668E-5  8
 .68885     3.2832
 .0031969    .015237
 .011488     .054755
 .029973    0


           P H A S E        T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$  EXAMPLE N. 4  ALPHA=.25  Q=15
:_$
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>ALPHA
ALPHA =  .25
:>Q=15
:><<< NULL LINE ENTERED >>>

        A              B
 *************     *
 3 2  1 4 1 0 0    6
 2 1  5 4 0 1 0    4
 1 3 -2 4 0 0 1    0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 *********************
 3 2  1 4 1 0 0  4.4286
 2 1  5 4 0 1 0  2.1429
 1 3 -2 4 0 0 1 -1
```

```
 ITER    BETROOTS
 ****   *********
  2     5.1634E-4
          .005847
          .042549
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  31    ITERATIONS

   CONVERG    CPUF2    CMIN      CMAX
 **********  *****  ******  *******
 -2.9567E-5  44.17  4.3622  -4.3624

   XPRIME       OLDX        DUAL       BETROOTS
 *********  *********  **********  *********
  .18923      .8401       1.3862E-4   .001057
  .0056251    .024973    -1.0908      .0061559
  .10333      .45876      -.22737     .072259
 3.1664E-5   1.4058E-4  -1.1193E-7   8
  .66907     2.9704
 9.4681E-5   4.2035E-4
 4.4215E-4    .001963
  .032178    0

          P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$
:_$ EXAMPLE N. 4.   ALPHA=.25   Q=20
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA
ALPHA =  .25
:>Q=20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         A          B
 ***************  *
 3 2  1 4 1 0 0   6
 2 1  5 4 0 1 0   4
 1 3 -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
```

```
:><<< NULL LINE ENTERED >>>

        AUGMENTA
**********************
3 2  1 4 1 0 0  4.4286
2 1  5 4 0 1 0  2.1429
1 3 -2 4 0 0 1 -1

DISCREP   RHS   ARTIFC
*******   ***   ******
-4.4286     6       0
-2.1429     4       0
 1          0       0
                     0
                     0
                     0
                     0
                     0
                     1

ITER    BETROOTS
****   *********
 4      .0046172
        .011794
        .63725
       9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  51    ITERATIONS

  CONVERG    CPUF1      CMIN        CMAX
*********  *****  *********  **********
7.0064E-7   69.85  4.6088E-7  3.5814E-12

   XPRIME       OLDX         DUAL       BETROOTS  INTERIOR
*********  *********  ***********  *********  ********
 .045505     .2694      3.7897E-12  4.8743E-4  .045505
 .017656     .10453    -4.7893E-12   .0056138  .017656
 .091856     .54381    -2.1435E-11   .040417   .091856
 .01108      .065596    1.1894E-8    9         .01108
 .70547     4.1765                             .70547
 .063382     .37524                            .063382
 .040921     .24226                            .040921
7.7849E-8   4.6088E-7                          .02413
 .02413     0

     P H A S E      O N E      E N D S

      P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>ITER
ITER =  51
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>
```

```
            A             B      C
   *************          *    ******
   3 2  1 4 1 0 0         6    2.4091
   2 1  5 4 0 1 0         4    1.7727
   1 3 -2 4 0 0 1         0    5
                               2
                               0
                               0
                               0

   ITER    BBTROOTS
   ****    *********
    2      5.1631E-4
            .0058471
            .042544
          8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (48)   ITERATIONS

   CONVERG     CPUF2   CMIN     CMAX
 **********   *****   ******   *******
 -8.6911E-7   69.96   4.3636   -4.3636        OK.

   XPRIME       OLDX          DUAL         BBTROOTS
 *********    *********    ***********    *********
  .20024       .87744       4.2012E-6      .0011221
  .0013777     .0060372    -1.0909         .0060305
  .10219       .44781      -.22728         .074886
 9.2649E-7    4.0599E-6    -8.2242E-10    8
  .66357      2.9078
 2.7787E-6    1.2176E-5
 1.3304E-5    5.8296E-5
  .032601     0


             P H A S E       T W O         E N D S

MANUAL MODE
:_$
:_$
:_$
:_$
:_$    EXAMPLE N. 4.   ALPHA=.5    Q=20
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E    O N E    B E G I N S

 INPUT ALPHA Q
:>ALPHA=.5
:>Q
Q =  20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
```

```
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************   *
 3  2   1  4  1  0  0   6
 2  1   5  4  0  1  0   4
 1  3  -2  4  0  0  1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3  2   1  4  1  0  0   4.4286
 2  1   5  4  0  1  0   2.1429
 1  3  -2  4  0  0  1  -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1


 ITER    BETROOTS
 ****   *********
  4      .0038892
         .0068944
         .40381
        9

 RESULTS AFTER  ITER =  23     ITERATIONS

  CONVERG   CPUF1       CMIN          CMAX
 ********  *****   *********   **********
 7.067E-7   29.9    4.6683E-7   8.7774E-12

   XPRIME        OLDX          DUAL        BETROOTS   INTERIOP
 *********   *********   ***********   *********   ********
  .046706      .27768     9.302E-12    4.7861E-4   .046706
  .017019      .10118    -1.1759E-11    .0055229   .017019
  .090713      .53931    -5.3151E-11    .040071    .090713
  .01048       .062306    1.854E-8     9           .01048
  .70242      4.176                                .70242
  .066891      .39768                              .066891
  .041741      .24816                              .041741
 7.8522E-8   4.6683E-7                             .024029
  .024029     0

      P H A S E     O N E     E N D S
```

```
      P H A S E        T W O        B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

          A          B      C
 ***************   *   ******
 3 2   1 4 1 0 0    6   2.4091
 2 1   5 4 0 1 0    4   1.7727
 1 3  -2 4 0 0 1    0   5
                        2
                        0
                        0
                        0

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER    BBTROOTS
 ****   *********
  2     5.4122E-4
         .0059996
         .044567
        8

 RESULTS AFTER  ITER =  26    ITERATIONS

   CONVERG    CPUF2    CMIN      CMAX
 **********  *****  ******  *******
 -6.4298E-7  38.38   4.3636  -4.3636    OK

   XPRIME       OLDX          DUAL        BBTROOTS
 *********   *********   ***********   *********
  .20122       .88075      1.6878E-6     .001127
 9.8307E-4     .004303    -1.0909        .0060213
  .10209       .44684      -.22727       .075073
 2.9657E-7   1.2981E-6   -7.4246E-10   8
  .66307     2.9023
 8.8966E-7   3.8941E-6
 4.2693E-6   1.8687E-5
  .032638    0

          P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$
:_$    EXAMPLE N. 4.  ALPHA=.75   Q=20
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S
```

```
 INPUT ALPHA Q
:>ALPHA=.75
:>Q
Q =  20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************  *
 3 2   1 4 1 0 0   6
 2 1   5 4 0 1 0   4
 1 3  -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1

 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1

 ITER    EBTROOTS
 ****   **********
  4       .0035206
          .0039267
          .24224
         9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  13    ITERATIONS

  CONVERG    CPUF1      CMIN         CMAX
 **********  *****  **********  ***********
 9.4436E-7   19.08  6.2645E-7   6.7124E-11

   XPRIME        OLDX          DUAL        EBTROOTS   INTERIOR
 **********  **********  ************  **********  ********
  .047632      .28438      7.1008E-11  4.7034E-4   .047632
  .016363      .097694    -8.9732E-11   .0054351   .016363
  .089559      .53469     -4.1019E-10   .039731    .089559
  .010021      .05983      5.1008E-8    9          .010021
```

```
  .69971    4.1775                                            .69971
  .070478    .42077                                           .070478
  .04231     .2526                                            .04231
 1.0493E-7  6.2645E-7                                         .023928
  .023928   0


       P H A S E     O N E     E N D S


        P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

         A          B    C
 *************      *   ******
 3 2  1 4 1 0 0    6   2.4091
 2 1  5 4 0 1 0    4   1.7727
 1 3 -2 4 0 0 1    0   5
                       2
                       0
                       0
                       0


 ITER   BBTROOTS
 ****   *********
  2     5.7265E-4
         .0061722
         .046864
        8


 RESULTS AFTER  ITER = (17)    ITERATIONS

   CONVERG    CPUF2   CMIN     CMAX
 **********  *****  ******  *******
 -9.3185E-7  23.96  4.3636  -4.3636


   XPRIME       OLDX        DUAL        BBTROOTS
 *********   *********   **********   *********
  .201        .88002      1.7563E-6    .0011242
  .0010712    .00469     -1.0909       .0060267
  .10211      .44705      -.22727      .074967
 2.4231E-7   1.0609E-6   -1.324E-9    8
  .66318     2.9035
 7.2692E-7   3.1825E-6
 3.4891E-6   1.5276E-5
  .03263     0


            P H A S E        T W O         E N D S

MANUAL MODE
:_$
:_$
:_$  EXAMPLE N. 4.  ALPHA=.9   Q=20
:_$
:_$
```

```
:_KARMARKAR
EXECUTION STARTED

 P H A S E    O N E    B E G I N S

 INPUT ALPHA Q
:>ALPHA=.9
:>Q
Q =  20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         A           B
 *************       *
 3 2  1 4 1 0 0      6
 2 1  5 4 0 1 0      4
 1 3 -2 4 0 0 1      0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 *********************
 3 2  1 4 1 0 0  4.4286
 2 1  5 4 0 1 0  2.1429
 1 3 -2 4 0 0 1 -1


 DISCREP  RHS  ARTIFC
 *******  ***  ******
 -4.4286   6      0
 -2.1429   4      0
  1        0      0
                  0
                  0
                  0
                  0
                  1


 ITER   BBTROOTS
 ****  *********
  4     .0024894
        .0038033
        .17396
       9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 10   ITERATIONS

  CONVERG    CPUF1     CMIN        CMAX
 *********  *****  *********  **********
 1.9434E-7  15.24  1.2925E-7  1.8502E-11


    XPRIME        OLDX          DUAL        BBTROOTS  INTERIOR
```

```
*********   *********   ***********   *********   ********
 .048022     .28745      1.9529E-11   4.6543E-4   .048022
 .015955     .095503    -2.4668E-11    .005383    .015955
 .088844     .5318      -1.1363E-10    .039525    .088844
 .009825     .05881      2.6691E-8    9           .009825
 .69826     4.1796                                .69826
 .072733     .43536                               .072733
 .042499     .25439                               .042499
2.1593E-8   1.2925E-7                             .023866
 .023866    0


     P H A S E      O N E      E N D S


      P H A S E        T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A            B      C
 *************       *    ******
 3 2  1 4 1 0 0      6    2.4091
 2 1  5 4 0 1 0      4    1.7727
 1 3 -2 4 0 0 1      0    5
                          2
                          0
                          0
                          0


 ITER   BBTROOTS
 ****   *********
  2     5.9482E-4
         .0062893
         .048381
        8

 RESULTS AFTER  ITER = (15)   ITERATIONS

   CONVERG    CPUF2   CMIN     CMAX
 **********   *****  ******  *******
 -4.5684E-7   21.55  4.3636  -4.3636      OK

   XPRIME       OLDX          DUAL         BBTROOTS
 *********   *********   ***********   *********
  .20152       .88175      7.4451E-7     .0011273
 8.6281E-4     .0037753   -1.0909        .0060207
  .10205       .44654      -.22727       .075086
 8.8658E-8   3.8793E-7   -2.4562E-10   8
  .66292     2.9006
 2.6597E-7   1.1638E-6
 1.2767E-6   5.5862E-6
  .032649    0


          P H A S E           T W O           E N D S

MANUAL MODE
```

```
:_$
:_$
:_$
:_$    EXAMPLE N. 4.  ALPHA=1  Q=20
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E      O N E       B E G I N S

 INPUT ALPHA Q
:>ALPHA=1
:>Q
Q =  20
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A              B
 ***************         *
 3 2   1 4 1 0 0         6
 2 1   5 4 0 1 0         4
 1 3  -2 4 0 0 1         0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1

 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1

 ITER    BBTROOTS
 ****   *********
  4       .0018787
          .0039192
          .13858
         9

 RESULTS AFTER  ITER =  7    ITERATIONS

   CONVERG     CPUF1       CMIN          CMAX
 **********   *****   **********   **********
```

```
1.9547E-15   10.77   1.3024E-15   9.8474E-11

 XPRIME       OLDX        DUAL          BBTROOTS    INTERIOR
**********   **********  ***********   *********   ********
 .048217      .28914      1.0374E-10   4.6204E-4   .048217
 .015666      .093943    -1.3099E-10    .0053472   .015666
 .08834       .52974     -6.0688E-10    .039381    .08834
 .0097253     .058319     6.1436E-8    9           .0097253
 .69733      4.1817                                .69733
 .074336      .44577                               .074336
 .042563      .25524                               .042563
2.1719E-16   1.3024E-15                            .023823
 .023823     0

     P H A S E     O N E     E N D S

     P H A S E     T W O     B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

       A            B    C
*************       *    *****
3 2  1 4 1 0 0      6    2.4091
2 1  5 4 0 1 0      4    1.7727
1 3 -2 4 0 0 1      0    5
                         2
                         0
                         0
                         0

 ITER   BBTROOTS
 ****   *********
  2     6.1102E-4
         .0063737
         .049457
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = (13)   ITERATIONS

 CONVERG     CPUF2   CMIN     CMAX
*********    *****   ******   *******
-6.625E-7    19.46   4.3636   -4.3636
```

OK

```
 XPRIME       OLDX        DUAL          BBTROOTS
*********    *********   ***********   *********
 .20115       .88051      9.9183E-7     .0011241
 .0010127     .0044331   -1.0909        .006027
 .10209       .44691      -.22727       .074962
1.067E-7     4.6707E-7   -1.9899E-13   8
 .66311      2.9027
3.201E-7     1.4012E-6
1.5365E-6    6.7258E-6
```

```
   .032635    0

          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$  EXAMPLE N. 4    ALPHA=1.1    Q=20
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E      O N E      B E G I N S

 INPUT ALPHA Q
:>ALPHA=1.1
:>Q
Q =  20
:>ALPHA
ALPHA =  1.1
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************   *
 3  2   1  4  1  0  0   6
 2  1   5  4  0  1  0   4
 1  3  -2  4  0  0  1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3  2   1  4  1  0  0   4.4286
 2  1   5  4  0  1  0   2.1429
 1  3  -2  4  0  0  1  -1

 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1

 ITER    BBTROOTS
 ****   *********
  4       .0014039
          .0040755
          .11017
```

```
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 100   ITERATIONS

 CONVERG   CPUF1  CMIN  CMAX
 *******  ******  ****  ****
 -.26596  141.01  -1.6  -2.8

  XPRIME         OLDX          DUAL         BETROOTS    INTERIOF
 *********     **********    **********     *********   *********
 4.4942E-33    2.4333E-31     .056         2.3682E-5   4.4942E-33
 1.6422E-33    8.8914E-32   -.784          .0073392    1.6422E-33
  .10343       5.6          -2.182         .038964      .10343
 1.0599E-33    5.7385E-32   -.0032835   9              1.0599E-33
  .92348       50                                       .92348
 1.1992E-32    6.4926E-31                              1.1992E-32
 4.8164E-33    2.6077E-31                              4.8164E-33
 -.029551      -1.6                                     .0026385
  .0026385      0
```

INFEASIBLE.

```
     P H A S E     O N E     E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>ITER
ITER =  100
:>$
:>$
:>$
:>$  EXAMPLE N. 4 ALPHA=.25  Q=30
:>$
:>$
:>KARMARKAR
EXECUTION STARTED

  P H A S E    O N E     B E G I N S

 INPUT ALPHA Q
:>ALPHA=.25
:>Q=30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         A           B
 *************       *
 3 2  1 4 1 0 0      6
 2 1  5 4 0 1 0      4
 1 3 -2 4 0 0 1      0
```

```
INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,  Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

        AUGMENTA
 **********************
 3 2  1 4 1 0 0  4.4286
 2 1  5 4 0 1 0  2.1429
 1 3 -2 4 0 0 1 -1


 DISCREP  RHS  ARTIFC
 *******  ***  ******
 -4.4286    6      0
 -2.1429    4      0
  1         0      0
                   0
                   0
                   0
                   0
                   1


 ITER   BBTROOTS
 ****  *********
  4     .0046172
        .011794
        .63725
       9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  72    ITERATIONS

   CONVERG    CPUF1      CMIN         CMAX
 **********  *****  **********  **********
 8.7325E-10  99.61  5.7443E-10  5.5633E-18


   XPRIME       OLDX         DUAL       BBTROOTS  INTERIOR
 **********  **********  **********  *********  ********
  .045505      .2694       5.887E-18  4.8743E-4  .045505
  .017656      .10453     -7.4397E-18   .0056138  .017656
  .091856      .54381     -3.3297E-17   .040417   .091856
  .01108       .065596     1.4824E-11  9          .01108
  .70547      4.1766                              .70547
  .063382      .37524                             .063382
  .040921      .24226                             .040921
 9.7027E-11  5.7443E-10                            .02413
  .02413      0


     P H A S E     O N E     E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>ITER
```

```
ITER =  72
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

          A          B      C
 ***************   *   ******
 3 2   1 4 1 0 0   6   2.4091
 2 1   5 4 0 1 0   4   1.7727
 1 3  -2 4 0 0 1   0   5
                       2
                       0
                       0
                       0


 ITER    BBTROOTS
 ****   *********
  2     5.163E-4
         .0058471
         .042543
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  80   ITERATIONS

   CONVERG      CPUF2    CMIN      CMAX
 ***********  ******  ******  *******
 -3.8233E-10  113.37  4.3636  -4.3636      OK.


   XPRIME       OLDX         DUAL       BBTROOTS
 *********  *********  ***********  *********
  .20341      .88812     5.0381E-9    .0011422
 9.3277E-5  4.0727E-4  -1.0909        .0059928
  .10184      .44467     -.22727      .075642
 1.1993E-9  5.2362E-9   2.0548E-11  8
  .66194     2.8902
 3.5978E-9  1.5709E-8
 1.7269E-8  7.5399E-8
  .032719   0

          P H A S E        T W O        E N D S

MANUAL MODE
:_$
:_$
:_$  EXAMPLE N. 4. ALPHA=.5  Q=30
:_Q
Q =  30
:_$
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA Q
```

```
:>ALPHA=.5
:>Q
Q =  30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************   *
 3 2   1 4 1 0 0   6
 2 1   5 4 0 1 0   4
 1 3  -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1


 ITER    BBTROOTS
 ****   *********
  4       .0038892
          .0068944
          .40381
         9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  32    ITERATIONS

   CONVERG    CPUF1       CMIN          CMAX
 **********  *****  **********  **********
 7.9984E-10  43.56  5.2836E-10  1.1244E-17


   XPRIME        OLDX          DUAL        BBTROOTS  INTERIOP
 **********  **********  ***********  *********  ********
  .046706      .27768      1.1916E-17  4.7861E-4  .046706
  .017019      .10118     -1.5062E-17   .0055229  .017019
  .090713      .53931     -6.8084E-17   .04007    .090713
  .01048       .062306     2.0983E-11   9         .01048
  .70242      4.1761                              .70242
```

```
  .066891     .39769                                     .066891
  .041741     .24816                                     .041741
 8.8871E-11  5.2836E-10                                  .024029
  .024029    0

      P H A S E     O N E     E N D S


       P H A S E       T W O       B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

        A            B     C
 *************       *   ******
 3 2  1 4 1 0 0      6   2.4091
 2 1  5 4 0 1 0      4   1.7727
 1 3 -2 4 0 0 1      0   5
                         2
                         0
                         0
                         0


 ITER   BBTROOTS
 ****   ********
  2     5.4122E-4
         .0059996
         .044567
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 42    ITERATIONS

   CONVERG    CPUF2   CMIN     CMAX
 *********   *****   ******   *******
 7.7163E-12  59.39   4.3636   -4.3636


   XPRIME       OLDX        DUAL        BBTROOTS
 *********   ********   **********   ********
  .20324      .88755     6.2994E-10   .0011412
 1.6173E-4   7.0629E-4  -1.0909       .0059947
  .10186      .44484     -.22727      .075604
 4.4142E-10  1.9277E-9   8.8539E-11  8
  .66202     2.8911
 1.3243E-9   5.7831E-9
 6.3564E-9   2.7759E-8
  .032713    0


          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$ EXAMPLE N. 4. ALPHA=.75  Q=30
:_$
```

```
:_$
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E     B E G I N S

 INPUT ALPHA Q                                                    - 106 -
:>ALPHA=.75
:>Q
Q =   30
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************  *
 3 2   1 4 1 0 0   6
 2 1   5 4 0 1 0   4
 1 3  -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =   1
:><<< NULL LINE ENTERED >>>

         AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1


 ITER    BBTROOTS
 ****   *********
  4       .0035206
          .0039267
          .24224
        9


 RESULTS AFTER  ITER =  (18)   ITERATIONS

   CONVERG    CPUF1      CMIN          CMAX
 **********  *****  **********  **********
 5.8918E-10  23.7   3.9084E-10  2.6126E-17


   XPRIME        OLDX          DUAL       BBTROOTS  INTERIOP
 **********  **********  **********  *********  ********
```

```
 .047632       .28438        2.7639E-17  4.7033E-4   .047632
 .016363       .097694      -3.4927E-17   .0054351   .016363
 .089559       .53469       -1.5966E-16   .03973     .089559
 .010021       .05983        3.1823E-11  9           .010021
 .69971       4.1775                                  .69971
 .070478       .42077                                 .070478
 .04231        .2526                                  .04231
6.5464E-11    3.9084E-10                              .023928
 .023928      0


      P H A S E     O N E     E N D S


       P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

         A           B     C
 *************       *   ******
 3 2  1 4 1 0 0      6   2.4091
 2 1  5 4 0 1 0      4   1.7727
 1 3 -2 4 0 0 1      0   5
                         2
                         0
                         0
                         0

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 ITER   BBTROOTS
 ****  *********
  2    5.7265E-4
        .0061722
        .046863
       8

 RESULTS AFTER  ITER = (28)   ITERATIONS

   CONVERG     CPUF2   CMIN     CMAX
 **********   *****   ******   *******
 7.7412E-10   41.2    4.3636   -4.3636        OK

   XPRIME       OLDX          DUAL         BBTROOTS
 **********   **********   ***********   *********
  .20348       .88838       4.6759E-9     .0011423
 6.2139E-5    2.7129E-4    -1.0909        .0059927
  .10184       .4446        -.22727       .075645
 1.7162E-10   7.4925E-10   -1.6476E-10   8
  .6619       2.8897
 5.1485E-10   2.2477E-9
 2.4713E-9    1.0789E-8
  .032722     0


        P H A S E        T W O        E N D S
```

```
:_ITERLIM=200
:_A=VERT(ADATA5)
:_B=VERT(BDATA5)
:_C=VERT(CDATA5)
:_AP=ALPHA5
EXECUTION STARTED

 P H A S E     O N E     B E G I N S

 INPUT ALPHA Q
:ALPHA Q
:[illegible] ALPHA.5" MISPLACE DEC. PT.
:Q=30
:ALPHA=.5
```

```
:>>>> NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:>>>> NULL LINE ENTERED >>>

       A          B
 *************    *
 3 2  1 4 1 0 0   6
 2 1  5 4 0 1 0   4
 1 3 -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:>>>> NULL LINE ENTERED >>>

        AUGMENTA
 **********************
 3 2  1 4 1 0 0  4.4286
 2 1  5 4 0 1 0  2.1429
 1 3 -2 4 0 0 1 -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286    6      0
 -2.1429    4      0
  1         0      0
                   0
                   0
                   0
                   0
                   1


  ITER    BBTROOTS
  ****   *********
   4      .0024894
          .0038033
          .17396
        9


 RESULTS AFTER  ITER =  13    ITERATIONS

  CONVERG     CPUF1    CMIN         CMAX
 **********   *****  **********   *********
 1.4114E-10   17.65  9.3871E-11   9.759E-18


  XPRIME       OLDX        DUAL          BBTROOTS    INTERIOR
 **********  **********  ***********   *********   ********
  .048022     .28745      1.0301E-17   4.6542E-4   .048022
  .015955     .095505    -1.3012E-17    .005383    .015955
  .088844     .5318      -5.9937E-17    .039524    .088844
  .009825     .05881      1.9385E-11   9           .009825
  .69826     4.1796                                .69826
  .072733     .43536                               .072733
  .042499     .25439                               .042499
 1.5682E-11  9.3871E-11                            .023866
  .023866    0
```

P H A S E   O N E   E N D S

P H A S E   T W O   B E G I N S

INPUT IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN=-1
:>>>> NULL LINE ENTERED >>>

```
       A            B    C
*************       *  *****
3 2  1 4 1 0 0      6  2.4091
2 1  5 4 0 1 0      4  1.7727
1 3 -2 4 0 0 1      0  5
                       2
                       0
                       0
                       0
```

```
ITER  BBTROOTS
****  ********
 2    5.9482E-4
       .0062893
       .048381
      8
```

MEMORY EXHAUSTED - UNMAPPING LINKULES
UNLOAD LOADED LINKULES TO INCREASE MEMORY

RESULTS AFTER ITER = 23 ITERATIONS

CONVERG	CPUF2	CMIN	CMAX
-1.8912E-10	33.16	4.3636	-4.3636

XPRIME	OLDX	DUAL	BBTROOTS
.20345	.88825	1.0881E-8	.0011416
7.7189E-5	3.3701E-4	-1.0909	.005994
.10184	.44463	-.22727	.075619
1.3678E-10	5.9719E-10	-4.6473E-10	8
.66192	2.8899		
4.1034E-10	1.7916E-9		
1.9696E-9	8.5995E-9		
.03272	0		

P H A S E   T W O   E N D S

```
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

          A              B       C
 *************           *     ******
 3 2   1 4 1 0 0         6     2.4091
 2 1   5 4 0 1 0         4     1.7727
 1 3  -2 4 0 0 1         0     5
                               2
                               0
                               0
                               0

 ITER    BBTROOTS
 ****    *********
  2      5.9671E-4
          .0063845
          .04542
         8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER #  200    ITERATIONS

   CONVERG      CPUF2    CMIN      CMAX
 **********    ******   ******   *******
 -8.2425E-4    288.23   130.56   -31.498

   XPRIME       OLDX         DUAL       BBTROOTS
 *********   *********    *********    *********
  .033004     5.2574       -.804       4.3954E-5
  .012656     2.016        -6.6686      .0082251
  .1422       22.652      -12.546       .0095342
  .0033207     .52897       .07928     8.0039
  .68609     109.29
  .067711     10.786
  .054123      8.6214
 8.9682E-4     0

          P H A S E          T W O          E N D S

MANUAL MODE
:_$
:_$
:_$
:_$   EXAMPLE N. 4. ALPHA=.5 Q=40
:_$
:_$
```

```
:_KARMARKAR
EXECUTION STARTED

  P H A S E     O N E      B E G I N S

 INPUT ALPHA 0                                                    - 112 -
:>ALPHA=.5
:>Q=40
:><<< NULL LINE ENTERED >>>
INPUT ARE THE MATRIX A AND VECTOR B DEFINED? (Y/N) Y=1 N=Y=0,Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

          A          B
 ***************  *
 3 2   1 4 1 0 0   6
 2 1   5 4 0 1 0   4
 1 3  -2 4 0 0 1   0

INPUT ARE DATA OK? (Y/N) Y=1 N=Y=0,   Y
:>Y
Y =  1
:><<< NULL LINE ENTERED >>>

         AUGMENTA
 ************************
 3 2   1 4 1 0 0   4.4286
 2 1   5 4 0 1 0   2.1429
 1 3  -2 4 0 0 1  -1


 DISCREP   RHS   ARTIFC
 *******   ***   ******
 -4.4286     6       0
 -2.1429     4       0
  1          0       0
                     0
                     0
                     0
                     0
                     1


 ITER    BBTROOTS
 ****   *********
  4      .0038892
         .0068944
         .40381
        9

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER =  41    ITERATIONS

   CONVERG    CPUF1     CMIN         CMAX
 **********  *****  ********  **********
 9.0526E-13  53.53  5.98E-13  1.4403E-23


   XPRIME       OLDX         DUAL       BBTROOTS  INTERIOR
 **********  ********  ***********  *********  ********
```

```
 .046706     .27768     1.5263E-23  4.7861E-4  .046706
 .017019     .10118    -1.9295E-23   .0055229  .017019
 .090713     .53931    -8.7214E-23   .04007    .090713
 .01048      .062306    2.3749E-14  9          .01048
 .70242     4.1761                             .70242
 .066891     .39768                            .066891
 .041741     .24816                            .041741
1.0059E-13  5.98E-13                           .024029
 .024029    0


     P H A S E     O N E     E N D S


      P H A S E      T W O      B E G I N S

INPUT  IS THE PROBLEM A MIN=1 OR A MAX(MIN=-1) ?, MIN
:>MIN
MIN = -1
:><<< NULL LINE ENTERED >>>

       A           B     C
 *************     *   ******
 3 2  1 4 1 0 0    6   2.4091
 2 1  5 4 0 1 0    4   1.7727
 1 3 -2 4 0 0 1    0   5
                       2
                       0
                       0
                       0


 ITER   BBTROOTS
 ****   *********
  2     5.4122E-4
         .0059996
         .044567
        8

*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*
*MEMORY EXHAUSTED - UNMAPPING LINKULES*
*UNLOAD LOADED LINKULES TO INCREASE MEMORY*

 RESULTS AFTER  ITER = 200  ITERATIONS

  CONVERG     CPUF2   CMIN    CMAX
 **********  ******  *****  *******
 -1.0625E-6  291.32  4.364  -4.3639      OK.


  XPRIME     OLDX       DUAL       BBTROOTS
 *********  *********  **********  *********
```

```
 .068991      .35535     -1.6625E-5    .0010532
 .054832      .28242     -1.0909       .00784
 .11677       .60144      -.22732      .051479
3.1882E-6   1.6421E-5    1.8795E-6  8
 .73161      3.7682
9.681E-6    4.9863E-5
5.1298E-5   2.6421E-4
 .027736     0

          P H A S E          T W O          E N D S
```