MATLAB作业三

1. 请将下面给出的矩阵A和B输入到MATLAB环境中，并将它们转换成符号矩阵。若某一矩阵为数值矩阵，另一矩阵为符号矩阵，两矩阵相乘是符号矩阵还是数值矩阵。



Code:

clc;clearvars;

A = [5,7,6,5,1,6,5;2,3,1,0,0,1,4;6,4,2,0,6,4,4;3,9,6,3,6,6,2;

10,7,6,0,0,7,7;7,2,4,4,0,7,7;4,8,6,7,2,1,7];

B = [3,5,5,0,1,2,3;3,2,5,4,6,2,5;1,2,1,1,3,4,6;3,5,1,5,2,1,2;

4,1,0,1,2,0,1;-3,-4,-7,3,7,8,12;1,-10,7,-6,8,1,5];

A = sym(A)

% 数值矩阵和符号矩阵相乘

A \* B

B = sym(B)

Result:

A =

[ 5, 7, 6, 5, 1, 6, 5]

[ 2, 3, 1, 0, 0, 1, 4]

[ 6, 4, 2, 0, 6, 4, 4]

[ 3, 9, 6, 3, 6, 6, 2]

[10, 7, 6, 0, 0, 7, 7]

[ 7, 2, 4, 4, 0, 7, 7]

[ 4, 8, 6, 7, 2, 1, 7]

ans =

[48, 3, 64, 48, 159, 106, 194]

[17, -26, 47, -8, 62, 26, 59]

[48, -8, 52, 12, 108, 64, 124]

[59, 22, 41, 69, 151, 101, 184]

[43, -22, 91, 13, 175, 121, 220]

[29, -31, 53, 11, 144, 101, 182]

[75, 11, 115, 36, 151, 70, 151]

B =

[ 3, 5, 5, 0, 1, 2, 3]

[ 3, 2, 5, 4, 6, 2, 5]

[ 1, 2, 1, 1, 3, 4, 6]

[ 3, 5, 1, 5, 2, 1, 2]

[ 4, 1, 0, 1, 2, 0, 1]

[-3, -4, -7, 3, 7, 8, 12]

[ 1, -10, 7, -6, 8, 1, 5]

数值矩阵与符号矩阵相乘仍然是符号矩阵。

1. 利用MATLAB语言提供的现成函数对习题1中给出的两个矩阵进行分析，判定它们是否为奇异矩阵，得出矩阵的秩、行列式、迹和逆矩阵，检验得出的逆矩阵是否正确。

Code:

clc;clearvars;

A = [5,7,6,5,1,6,5;2,3,1,0,0,1,4;6,4,2,0,6,4,4;3,9,6,3,6,6,2;

10,7,6,0,0,7,7;7,2,4,4,0,7,7;4,8,6,7,2,1,7];

B = [3,5,5,0,1,2,3;3,2,5,4,6,2,5;1,2,1,1,3,4,6;3,5,1,5,2,1,2;

4,1,0,1,2,0,1;-3,-4,-7,3,7,8,12;1,-10,7,-6,8,1,5];

%矩阵 A 的秩

rank(A)

%矩阵 A 的行列式

det(A)

%矩阵 A 的迹

trace(A)

%矩阵 A 的逆矩阵

A\_inv = inv(A)

%验证逆矩阵

norm(A\_inv \* A-eye(7))

%矩阵 B 的秩

rank(B)

%矩阵 A 的行列式

det(B)

%矩阵 A 的迹

trace(B)

%矩阵 A 的逆矩阵

B\_inv = inv(B)

%验证逆矩阵

norm(B\_inv \* B-eye(7))

Result:

%矩阵 A 的秩

ans =

7

%矩阵 A 的行列式

ans =

-3.5432e+04

%矩阵 A 的迹

ans =

27

%矩阵 A 的逆矩阵

A\_inv =

0.5186 -0.2612 0.3128 -0.3859 0.0391 -0.2886 -0.0402

0.7298 0.1735 0.2343 -0.3007 -0.1059 -0.3969 -0.1656

-1.3574 -0.2625 -0.5826 0.6876 0.3476 0.5449 0.3635

0.6226 -0.1103 0.2362 -0.3215 -0.1793 -0.1901 -0.0554

-0.3479 -0.0501 0.0131 0.1821 -0.0143 0.1435 0.0885

0.2134 0.1448 0.0062 0.0213 -0.1040 0.0484 -0.1893

-0.5207 0.2799 -0.1881 0.2413 -0.0010 0.2936 0.1008

%验证逆矩阵

ans =

3.0702e-15

%矩阵 B 的秩

ans =

5

%矩阵 B 的行列式

ans =

-7.2077e-26

%矩阵 B 的迹

ans =

26

警告: 矩阵接近奇异值，或者缩放错误。结果可能不准确。RCOND = 1.080331e-17。

> 位置：ex3\_2 (第 27 行)

%矩阵 B 的逆矩阵

B\_inv =

1.0e+14 \*

0.7187 2.2891 -1.0780 -3.4336 1.1445 0.3593 -1.1445

-1.2510 -3.4750 1.8765 5.2125 -1.7375 -0.6255 1.7375

0.5323 1.6029 -0.7985 -2.4044 0.8015 0.2662 -0.8015

1.1179 2.8658 -1.6769 -4.2986 1.4329 0.5590 -1.4329

-2.7416 -4.7940 4.1123 7.1910 -2.3970 -1.3708 2.3970

-2.0229 2.0820 3.0343 -3.1231 1.0410 -1.0114 -1.0410

2.7416 1.0410 -4.1123 -1.5615 0.5205 1.3708 -0.5205

%验证逆矩阵

ans =

2.6886

我们根据矩阵的秩可以判断，矩阵A不是奇异矩阵，矩阵B是奇异矩阵。相应的，矩阵A的逆矩阵计算正确，矩阵B的逆矩阵计算不正确。

3、试求出习题1中给出的A和B矩阵的特征多项式、特征值与特征向量，并对它们进行LU分解。

Code:

clc;clearvars;

A = [5,7,6,5,1,6,5;2,3,1,0,0,1,4;6,4,2,0,6,4,4;3,9,6,3,6,6,2;

10,7,6,0,0,7,7;7,2,4,4,0,7,7;4,8,6,7,2,1,7];

B = [3,5,5,0,1,2,3;3,2,5,4,6,2,5;1,2,1,1,3,4,6;3,5,1,5,2,1,2;

4,1,0,1,2,0,1;-3,-4,-7,3,7,8,12;1,-10,7,-6,8,1,5];

%矩阵 A 的特征多项式

charpoly(sym(A))

%矩阵 A 的特征值、特征向量

[e\_A,V\_A] = eig(A);

e\_A,V\_A

%矩阵 A 的 LU 分解

[L\_A,U\_A,p\_A] = lu(A);

L\_A,U\_A

%矩阵 B 的特征多项式

charpoly(sym(B))

%矩阵 B 的特征值、特征向量

[e\_B,V\_B] = eig(B);

e\_B,V\_B

%矩阵 B 的 LU 分解

[L\_B,U\_B,p] = lu(B);

L\_B,U\_B

Result:

%特征多项式

ans =

[1, -27, -18, -1000, 3018, 24129, 2731, 35432]

% 特征向量

e\_A =

列 1 至 3

0.4166 + 0.0000i 0.0385 - 0.1349i 0.0385 + 0.1349i

0.1249 + 0.0000i -0.1426 + 0.1548i -0.1426 - 0.1548i

0.3357 + 0.0000i 0.2001 + 0.2826i 0.2001 - 0.2826i

0.4034 + 0.0000i 0.6021 + 0.0000i 0.6021 + 0.0000i

0.4462 + 0.0000i -0.1147 + 0.3618i -0.1147 - 0.3618i

0.4137 + 0.0000i -0.3247 + 0.0374i -0.3247 - 0.0374i

0.4064 + 0.0000i -0.0929 - 0.4405i -0.0929 + 0.4405i

列 4 至 6

0.3888 + 0.0000i -0.2542 + 0.3398i -0.2542 - 0.3398i

-0.0123 + 0.0000i -0.3717 - 0.0529i -0.3717 + 0.0529i

-0.7801 + 0.0000i 0.6241 + 0.0000i 0.6241 + 0.0000i

0.2996 + 0.0000i -0.2558 + 0.1058i -0.2558 - 0.1058i

0.3704 + 0.0000i 0.1728 + 0.0865i 0.1728 - 0.0865i

-0.1053 + 0.0000i -0.1023 - 0.2178i -0.1023 + 0.2178i

0.0469 + 0.0000i 0.2885 - 0.1854i 0.2885 + 0.1854i

列 7

-0.2543 + 0.0000i

0.4548 + 0.0000i

-0.1545 + 0.0000i

-0.2834 + 0.0000i

-0.1041 + 0.0000i

-0.5703 + 0.0000i

0.5368 + 0.0000i

% 特征值

V\_A =

列 1 至 3

28.6796 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i -1.6337 + 6.9741i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i -1.6337 - 6.9741i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

列 4 至 6

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

-3.4766 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0275 + 1.1755i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0275 - 1.1755i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

列 7

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

5.0094 + 0.0000i

% LU 分解

L\_A =

1.0000 0 0 0 0 0 0

0.3000 1.0000 0 0 0 0 0

0.7000 -0.4203 1.0000 0 0 0 0

0.6000 -0.0290 -0.9444 1.0000 0 0 0

0.4000 0.7536 0.2778 0.6484 1.0000 0 0

0.2000 0.2319 -0.7500 0.6429 0.5702 1.0000 0

0.5000 0.5072 0.5556 0.1099 0.5000 0.5376 1.0000

U\_A =

10.0000 7.0000 6.0000 0 0 7.0000 7.0000

0 6.9000 4.2000 3.0000 6.0000 3.9000 -0.1000

0 0 1.5652 5.2609 2.5217 3.7391 2.0580

0 0 0 5.0556 8.5556 3.4444 1.7407

0 0 0 0 -8.7692 -8.0110 2.5751

0 0 0 0 0 3.8534 1.5794

0 0 0 0 0 0 -1.9204

%特征多项式

ans =

[1, -26, 245, -593, 1702, 12192, 0, 0]

%特征向量

e\_B =

列 1 至 3

0.0306 - 0.3831i 0.0306 + 0.3831i -0.1431 - 0.2811i

-0.0138 - 0.4299i -0.0138 + 0.4299i -0.0257 + 0.0616i

0.1817 - 0.2554i 0.1817 + 0.2554i 0.1802 - 0.1874i

-0.1582 - 0.3661i -0.1582 + 0.3661i 0.0014 + 0.0928i

-0.0772 - 0.1682i -0.0772 + 0.1682i -0.1943 + 0.1869i

0.4838 + 0.0000i 0.4838 + 0.0000i 0.8268 + 0.0000i

0.3697 + 0.0701i 0.3697 - 0.0701i -0.2500 + 0.0316i

列 4 至 6

-0.1431 + 0.2811i 0.0205 + 0.0000i 0.0099 + 0.0000i

-0.0257 - 0.0616i -0.1918 + 0.0000i -0.0567 + 0.0000i

0.1802 + 0.1874i 0.2432 + 0.0000i 0.0145 + 0.0000i

0.0014 - 0.0928i 0.1273 + 0.0000i 0.0692 + 0.0000i

-0.1943 - 0.1869i 0.1376 + 0.0000i -0.3427 + 0.0000i

0.8268 + 0.0000i 0.6887 + 0.0000i -0.6879 + 0.0000i

-0.2500 - 0.0316i -0.6279 + 0.0000i 0.6333 + 0.0000i

列 7

-0.2499 + 0.0000i

0.3501 + 0.0000i

-0.1697 + 0.0000i

-0.2729 + 0.0000i

0.2968 + 0.0000i

-0.7179 + 0.0000i

0.3290 + 0.0000i

%特征值

V\_B =

列 1 至 3

12.3669 + 6.6610i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 12.3669 - 6.6610i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 1.8504 + 4.6859i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

列 4 至 6

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

1.8504 - 4.6859i 0.0000 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i -2.4345 + 0.0000i 0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i -0.0000 + 0.0000i

0.0000 + 0.0000i 0.0000 + 0.0000i 0.0000 + 0.0000i

列 7

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

0.0000 + 0.0000i

%LU分解

L\_B =

1.0000 0 0 0 0 0 0

0.2500 1.0000 0 0 0 0 0

-0.7500 0.3171 1.0000 0 0 0 0

0.7500 -0.1220 -0.6349 1.0000 0 0 0

0.7500 -0.4146 -0.8571 0.2565 1.0000 0 0

0.7500 -0.4146 -0.4233 0.6667 0.0000 1.0000 0

0.2500 -0.1707 -0.2381 0.1710 0.6667 -0.3797 1.0000

U\_B =

4.0000 1.0000 0 1.0000 2.0000 0 1.0000

0 -10.2500 7.0000 -6.2500 7.5000 1.0000 4.7500

0 0 -9.2195 5.7317 6.1220 7.6829 11.2439

0 0 0 6.1270 9.3016 7.0000 11.9683

0 0 0 0 5.4715 7.2047 10.7876

0 0 0 0 0 -0.0000 -0.0000

0 0 0 0 0 0 -0.0000

4、试求下面齐次方程的基础解系。



Code:

clc,clearvars;

A = [6,1,4,-7,-3;-2,-7,-8,6,0;-4,5,1,-6,8;-34,36,9,-21,49;-26,-12,-27,27,17];

rank(A);

null(A,'r')

Result:

ans =

3

%矩阵的秩为5，所以解空间的维数为2

ans =

2.9625 -0.7625

4.3250 -2.7250

-3.7750 2.5750

1.0000 0

0 1.0000

5、试求下面线性代数方程的解析解与数值解，并检验解的正确性。



Code:

format short;

clc,clearvars;

A = [2,-9,3,-2,-1;10,-1,10,5,0;8,-2,-4,-6,3;-5,-6,-6,-8,-4];

b = [-1,-4,0;-3,-8,-4;0,3,3;9,-5,3];

rank(A),rank([A b])

% 有无穷多解

% 数值解

x = A\b

x2 = null(A)

x3 = x+x2

% 验证数值解的正确性

norm(A\*x3-b)

%解析解

%特解

x4 = pinv(sym(A))\*b

%基础解系

x5 = null(sym(A))

x6 = x4+x5

norm(A\*x6-b)

Result:

%系数矩阵的秩

ans =

4

%增广矩阵的秩

ans =

4

%原方程组有解，且解不唯一

% 数值解

% 方程组一个特解

x =

0.1397 -0.6841 -0.1418

0.4939 0.0702 0.0385

0 0 0

-0.7805 -0.2178 -0.5086

-1.6043 2.4354 0.3867

% 方程组的基础解系

x2 =

0.2474

-0.2492

-0.5941

0.6434

-0.3312

% 测试方程组的一个解

x3 =

0.3871 -0.4366 0.1056

0.2446 -0.1790 -0.2107

-0.5941 -0.5941 -0.5941

-0.1371 0.4256 0.1348

-1.9355 2.1041 0.0555

%验证其正确性

ans =

6.3693e-15

% 解析解

%方程组的一个基础解系

x4 =

[ 5855203/37934051, -15309319/37934051, -686967/37934051]

[ 18172238/37934051, -8052497/37934051, -3265761/37934051]

[ -1338509/37934051, -25546018/37934051, -11269134/37934051]

[-28159371/37934051, 19405693/37934051, -7088191/37934051]

[-61602470/37934051, 78140599/37934051, 8386895/37934051]

%方程组的一个特解

x5 =

-127/170

307/408

3659/2040

-1321/680

1

%测试解

x6 =

[ -3822239967/6448788670, -7420208707/6448788670, -4934408867/6448788670]

[ 19060026761/15477092808, 8360334881/15477092808, 10313323169/15477092808]

[136070134249/77385464040, 86686815889/77385464040, 115811659249/77385464040]

[-69259253651/25795154680, -36915010131/25795154680, -54930851251/25795154680]

[ -23668419/37934051, 116074650/37934051, 46320946/37934051]

%验证其正确性

ans =

0

6、试判定下面的线性代数方程是否有解。



Code:

clc,clearvars;

A = [16,2,3,13;5,11,10,8;9,7,6,12;4,14,15,1];

b = [1;3;4;7];

rank(A),rank([A b])

Result:

ans =

3

ans =

4

由于系数矩阵的秩为3，增广矩阵的秩为4，因此该方程组无解。

7、求解能转换成多项式方程的联立方程，并检验得出的高精度数值解（准解析解）的精度。



(1)

Code:

clc,clearvars;

syms x y;

eqn = [x^2-y-1==0,(x-2)^2+(y-0.5)^2-1==0];

[x1 x2] = solve(eqn,[x y],"Real",true);

x1 = vpa(x1)

x2 = vpa(x2)

subs(eqn, [x y], [x1(1) x2(1)])

subs(eqn, [x y], [x1(2) x2(2)])

Result:

% x1的解

x1 =

1.067346085806689713408597312807

1.5463428833199450050728889725194

% x2的解

x2 =

0.13922766688686144048362498805141

1.3911763127942410521940863240803

% 第一个解的检验

ans =

[-2.5713938924237539236816111751737e-39 == 0, -2.2040519077917890774413810072917e-39 == 0]

% 第二个解的检验

ans =

[-3.3060778616876836161620715109376e-39 == 0, -2.5713938924237539236816111751737e-39 == 0]

（2）

Code:

format short;

clc,clearvars;

syms x y z;

eqn = [x^2\*y^2-z\*x\*y-4\*x^2\*y\*z^2-x\*z^2==0;x\*y^3-2\*y\*z^2-3\*x^3\*z^2-4\*x\*z\*y^2==0;

y^2\*x-7\*x\*y^2+3\*x\*z^2-x^4\*z\*y==0];

var = [x y z];

[x1,x2,x3] = solve(eqn,var);

x = vpa(x1,4)

y = vpa(x2,4)

z = vpa(x3,4)

subs(eqn,var,[0.3176,-0.1025,0.144])

for i=1:19

subs(eqn,var,[x(i) y(i) z(i)])

end

Result:

x =

0.3176

0.1809 - 0.4351i

0.1809 + 0.4351i

-0.6868

- 2.212 - 1.31i

- 2.212 + 1.31i

- 0.5587 - 2.33i

- 0.5587 + 2.33i

2.245

0.8015

1.94 + 1.846i

1.94 - 1.846i

- 0.1218 + 0.7661i

- 0.1218 - 0.7661i

1.241 + 2.673i

1.241 - 2.672i

-0.5732

-3.041

0

y =

-0.1025

0.05929 - 0.1456i

0.05929 + 0.1456i

0.2321

- 1.535 + 0.04295i

- 1.535 - 0.04295i

- 0.135 + 1.335i

- 0.135 - 1.335i

1.25

-0.4088

- 0.1952 - 2.176i

- 0.1952 + 2.176i

0.193 + 0.5509i

0.193 - 0.5509i

3.888 + 2.678i

3.888 - 2.678i

0.8819

6.221

0

z =

0.1444

- 0.08383 + 0.2087i

- 0.08383 - 0.2087i

-0.341

0.03846 + 0.5797i

0.03846 - 0.5797i

- 0.3635 - 0.4602i

- 0.3635 + 0.4602i

-0.5892

-0.6142

0.4523 - 0.5146i

0.4523 + 0.5146i

0.3186 + 0.7842i

0.3186 - 0.7842i

1.017 + 0.3701i

1.017 - 0.3701i

1.22

1.298

0

ans =

3024344809/156250000000000 == 0

-188711801669/31250000000000000 == 0

-13826965673697/122070312500000000 == 0

ans =

0.00000000000000010270003183102595087741114977603 == 0

-0.000000000000034482548311799074315921809250003 == 0

0.000000000000059155189158763624006388024139733 == 0

ans =

- 0.000000000000038277136960917234645869545107949 + 0.000000000000094213212258746584420593336689798i == 0

0.000000000000034614015445803344539509913374873 + 0.00000000000021813809009306674540915375243726i == 0

0.00000000000023275436255555761142708368341003 - 0.00000000000025015456291746116544786003177324i == 0

ans =

- 0.000000000000067423501173200486731753539455119 + 0.0000000000001181226661375616831385356292044i == 0

- 0.00000000000023969172250536042602684326179331 + 0.00000000000018993502690022426379778586506644i == 0

0.000000000000045125880631748902726770082761431 - 0.00000000000045656150380847552504851325067918i == 0

ans =

-0.00000000000015239390791491780661949163186419 == 0

-0.00000000000069047955959699361117571405618724 == 0

0.0000000000011425534706360200687000674121253 == 0

ans =

0.00000045064150496894283410661181455025 + 0.0000006793295441742418008074520518471i == 0

- 0.0000028347415373752328373272533446084 + 0.0000038638708508400186643078073015832i == 0

0.0000017660599061727977325259489637856 + 0.000011796848976418893683249065421528i == 0

ans =

0.00000080899328418996867078257625715017 + 0.000000099965698225121909272871308316982i == 0

0.000002192651562168832800988170581135 - 0.0000042606327622268525789678673267506i == 0

0.000011343241142941986716217784764713 - 0.0000036828084263243971513766777668376i == 0

ans =

0.000000000057139972156526079395816908440997 + 0.00000000007532937873574146599806221418369i == 0

- 0.000000000033811037862545119784140904004191 - 0.00000000075308828751571318134782058314077i == 0

0.0000000010705190343320254083587900634727 + 0.0000000011732408390924061191413964956702i == 0

ans =

0.00000040750818578086179453755676158993 + 0.00000027703112327596677070578391830455i == 0

- 0.0000047498467138752515942672234794008 + 0.00000027478847591121878630616711183547i == 0

0.0000084995263245683679795740912769099 + 0.0000064095201331664188860350226549458i == 0

ans =

-0.0000010290723063215355918212226363118 == 0

-0.0000027470679467976626613065755944266 == 0

0.0000014352276289275331407952311472353 == 0

ans =

-0.000000072158245168881697675187203321912 == 0

-0.000001086335495983577790562677042177 == 0

0.00000098294294168611152780397267351217 == 0

ans =

0.00000000060523011944186020195242866964727 + 0.00000000032617423008694263600866403248212i == 0

- 0.0000000010602531276887819543683814472618 - 0.0000000023057197877641606594268260508789i == 0

- 0.0000000017377225872938298433349248898516 - 0.0000000076398776343673364536458314463578i == 0

ans =

0.0000060247871716251049639402628649527 + 0.0000059901337381627706719536118413656i == 0

- 0.0000143915531358146746397517015122 + 0.000033125613759104325968265681857822i == 0

- 0.000046731509466479628827900202744558 + 0.00016301660311472435969624814595152i == 0

ans =

- 0.0000000060264558915611868810952547481711 + 0.0000000062199424200592674721455825002421i == 0

- 0.000000012342478763741148801788544193323 + 0.000000014711352450524679914580351561755i == 0

0.0000000032346488977614388077068533762958 - 0.0000000088132711866152467202714903880921i == 0

ans =

- 0.0000016468445407795139161925056493001 - 0.0000020376925944610231511283086501211i == 0

- 0.0000050106035398450902817443415510564 - 0.0000070127827404889022767899444411306i == 0

0.000000099334542463469750455411467557021 - 0.000000066420592970872628018171854426122i == 0

ans =

- 0.00061361695254121984326015880904059 + 0.0013095440278072654798611411691678i == 0

0.0034365917180847948881459880283932 + 0.014565149497427250967596335557917i == 0

- 0.079802044194614385958920905289127 + 0.031221550135104448548350768327125i == 0

ans =

- 0.00023935872537672395417536299333925 + 0.0016163025619240982435181801454581i == 0

- 0.012322261377250691394095010617956 + 0.01157375818389106987000087531734i == 0

0.055676744942859837566096131617666 + 0.079172139502360884307104505296862i == 0

ans =

0.00052400125557787087297524474212122 == 0

-0.0015165422361647264917943970776376 == 0

0.000043436047103014490486843123700472 == 0

ans =

0.0033431075563647958807192201115342 == 0

-0.032044387917549691095304587020825 == 0

0.21105185117985656409248448989461 == 0

ans =

0 == 0

0 == 0

0 == 0

8、用Jacobi、Gauss-Seidel迭代法求解方程组 ，给定初值为。

Code:

%Jacobi function

function y=jacobi(a,b,x0)

D=diag(diag(a)); U=-triu(a,1); L=-tril(a,-1);

B=D\(L+U); f=D\b;

y=B\*x0+f;

n=1;

while norm(y-x0)>=1.0e-6

x0=y;

y=B\*x0+f;

n=n+1;

end

%Seidel function

function y=seidel(a,b,x0)

D=diag(diag(a));U=-triu(a,1);L=-tril(a,-1);

G=(D-L)\U ;f=(D-L)\b;

y=G\*x0+f; n=1;

while norm(y-x0)>=1.0e-6

x0=y;

y=G\*x0+f;

n=n+1;

end

clc,clearvars;

A = [10,-1,-2;-1,10,-2;-1,-1,5];

b = [72;83;42];

x0 = [0;0;0];

% jacobi 方法计算方程的解

y1 =jacobi(A,b,x0)

% Gauss-Seidel 方法计算方程的解

y2 = seidel(A,b,x0)

Result:

% jacobi 方法计算方程的解

y1 =

11.0000

12.0000

13.0000

% Gauss-Seidel 方法计算方程的解

y2 =

11.0000

12.0000

13.0000

9、

Code:

clc,clearvars;

w=1.4;

x0=[1;1;1];

A = [2,-1,0;-1,2,-1;0,-1,2];

b = [1;0;1.8];

y = sor(A,b,w,x0)

Result:

y =

1.2000

1.4000

1.6000