[Question 1]

Consider the linear system:

3.333x1 + 15920x2 − 10.333x3 = 15913

2.222x1 + 16.710x2 + 9.612x3 = 28.544

1.5611x1 + 5.1791x2 + 1.6852x3 = 8.4254

Solve the system using:

(a) Gaussian elimination without pivoting.

Initial augmented matrix:

Forward Elimination

-------------------------------------------------------- iter: 1

R2: R2 - (2.2220/3.3330)\*R1

R3: R3 - (1.5611/3.3330)\*R1

-------------------------------------------------------- iter: 2

R3: R3 - (-0.0000/0.0009)\*R2

Back Substitution:

Thus,

*(b) Gaussian elimination with scaled partial pivoting.*

Initial augmented matrix:

Scale rows

Pivot row

pivot row

Thus,

Swap R1 with R3

Forward Elimination

-------------------------------------------------------- iter: 1

R2: R2 - (2.2220/1.5611)\*R1

R3: R3 - (3.3330/1.5611)\*R1

-------------------------------------------------------- iter: 2

Scale rows

Pivot row

pivot row

R3: R3 - (15908.9395/9.3398)\*R2

Back Substitution:

Thus,

c) Basic LU decomposition.

Forward Elimination

Back Substitution: Solve for Y

Thus,

:

:

Thus,

Back Substitution: Solve for X

:

:

:

Thus,

[Question 2]

*Consider the linear system Ax = b in which*

*(2.1) Use Gauss-Jordan method to solve the system Ax = b.*

Initial augmented matrix:

2 -3 1 0

1 1 -1 1

-1 1 -3 -3

Forward Elimination

-------------------------------------------------------- iter: 1

R2: R2 - (1/2)\*R1

R3: R3 - (-1/2)\*R1

2.0000 -3.0000 1.0000 0

0 2.5000 -1.5000 1.0000

0 -0.5000 -2.5000 -3.0000

-------------------------------------------------------- iter: 2

R3: R3 - (-0.5/2.5)\*R2

2.0000 -3.0000 1.0000 0

0 2.5000 -1.5000 1.0000

0 0 -2.8000 -2.8000

Back Substitution:

x\_3: -2.8/-2.8 = 1

x\_2: (1 - -1.5) /2.5 = 1

x\_1: (0 - -2) /2 = 1

1

1

1

Thus,

*(2.2) Use Gauss-Jordan method to compute the inverse A−1 exactly.*

Initial augmented matrix (with the identity matrix):

2 -3 1 0 1 0 0

1 1 -1 1 0 1 0

-1 1 -3 -3 0 0 1

Forward Elimination

-------------------------------------------------------- iter: 1

R2: R2 - (1/2)\*R1

R3: R3 - (-1/2)\*R1

2.0000 -3.0000 1.0000 1.0000 1.0000 0

0 2.5000 -1.5000 -0.5000 1.0000 0

0 -0.5000 -2.5000 0.5000 1.0000 0

-------------------------------------------------------- iter: 2

R2:R2×(2/7)

2.3) Use Cramer’s rule to compute the inverse A−1.

Thus,

[Question 3]

[Question 4]