



MATLAB

Gaussian Elimination

- ❑ Given a system of n equations in n unknowns we use the method of pivoting to solve for the unknowns. The method starts by subtracting multiples of the first equation from the other equations.
- ❑ The aim is to eliminate the first unknown from the second equation onwards. We use the coefficient of the first unknown in the first equation as the first pivot to achieve this. At the end of the first stage of elimination, there will be a column of zeros below the first pivot.
- ❑ Next, the pivot for the second stage of elimination is located in the second row second column of the system. A multiple of the second equation will now be subtracted from the remaining equations using the second pivot to create zeros just below it in that column.
- ❑ The process is continued until the system is reduced to an upper triangular one. The system can now be solved backward bottom to top.

Gaussian Elimination

Solve the matrix by using gaussian elimination:

$$X+2y+z=3, 2x+y-2z=3, -3x+y+z=-6$$

$$C = [1 \ 2 \ -1; \ 2 \ 1 \ -2; \ -3 \ 1 \ 1]$$

$$b = [3 \ 3 \ -6]'$$

$$A = [C \ b];$$

$$n = \text{size}(A, 1);$$

$$x = \text{zeros}(n, 1); \text{ \%variable matrix } [x1 \ x2 \ \dots \ xn] \text{ column}$$

$$\text{for } i=1:n-1$$

$$\text{for } j=i+1:n$$

$$m = A(j,i)/A(i,i)$$

$$A(j,:) = A(j,:) - m*A(i,:)$$

end

end

$$x(n) = A(n,n+1)/A(n,n)$$

$$\text{for } i=n-1:-1:1$$

$$\text{summ} = 0$$

$$\text{for } j=i+1:n$$

$$\text{summ} = \text{summ} + A(i,j)*x(j,:)$$

$$x(i,:) = (A(i,n+1) - \text{summ})/A(i,i)$$

end

end

Output:

$$x = 3, \quad y = 1, \quad z = 2$$

OUTPUT: C = 1 2 -1

2 1 -2

-3 1 1

b = 3

3

-6

m = 2

A = 1 2 -1 3

0 -3 0 -3

-3 1 1 -6

m = -3

A = 1 2 -1 3

0 -3 0 -3

0 7 -2 3

m = -2.3333333333333333

A = 1 2 -1 3

0 -3 0 -3

0 0 -2 -4

x = 0

0

2

summ = 0

summ = 0

x = 0

1

2

summ = 0

summ = 2

x = 1

1

2

summ = 0

x = 3

1

2

Gaussian Elimination

Practice Problems:

$$C = [1 \ 1 \ 1; 2 \ -6 \ -1; 3 \ 4 \ 2]$$

$$b = [11 \ 0 \ 0]$$

$$\text{Ans: } x=-8, y=-7, z=26$$

$$C = [2 \ 1 \ -1; 2 \ 5 \ 7; 1 \ 1 \ 1]$$

$$b = [0 \ 52 \ 9]'$$

$$\text{Ans: } x=1, y=3, z=5$$



THANK YOU
