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Assignment on

Gauss Elimination Method

Assignment no: 1

Course Code: CSE 223

Course Title: Numerical Analysis

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Assignment - 1

■ Solving the following system using the basic Gauss elimination method.

Ex: 7.2

$$3x_1 + 6x_2 + x_3 = 16 \longrightarrow (I)$$
$$2x_1 + 4x_2 + 3x_3 = 13 \longrightarrow (II)$$
$$x_1 + 3x_2 + 2x_3 = 9 \longrightarrow (III)$$

Soln: **Step 1:** $3 \times (II) - 2 \times (I)$

$$6x_1 + 12x_2 + 9x_3 - 6x_1 - 12x_2 - 2x_3 = 39 - 32$$

$$\Rightarrow 7x_3 = 7$$

$$\therefore x_3 = 1 \longrightarrow (IV)$$

$(I) - 3 \times (III)$

$$3x_1 + 6x_2 + x_3 - 3x_1 - 9x_2 - 6x_3 = 16 - 27$$

$$\Rightarrow -3x_2 - 5x_3 = -11 \longrightarrow (V)$$

$$3x_1 + 6x_2 + x_3 = 16 \longrightarrow (I)$$
$$x_3 = 1 \longrightarrow (II)$$
$$-3x_2 - 5x_3 = 11 \longrightarrow (III)$$

Step 2:
By putting value of x_3 in eqn (III) we get,

$$-3x_2 - 5 = -11$$
$$\Rightarrow -3x_2 = 3 - 6$$
$$\therefore x_2 = 2$$

By putting value of x_2 & x_3 in Eqn (I)

$$3x_1 + 12 + 1 = 16$$
$$\therefore x_1 = 1$$

So, the solution is, $x_1 = 1$, $x_2 = 2$, $x_3 = 1$ Ans:

Ex: Gauss elimination with pivoting.

$$3x_1 + 6x_2 + x_3 = 16$$

$$2x_1 + 4x_2 + 3x_3 = 13$$

$$x_1 + 3x_2 + 2x_3 = 9$$

Soln: Original system,

3	6	1	16
2	4	3	13
1	3	2	9

Step-1: No change.

3	6	1	16	⟶ (I)
2	4	3	13	⟶ (II)
1	3	2	9	⟶ (III)

Step-2: [(II) × 3 − (I) × 2] & [(III) × 3 − (I)]

3	6	1	16	⟶ (I)
0	0	7	7	⟶ (II)
0	3	5	11	⟶ (III)

Step-3: We already got a triangular shape. So, we don't need to do this step.

Now, solving for x_3,

$$7x_3 = 7$$
$$\therefore x_3 = 1$$

Solving for x_2,

$$3x_2 + 5 \times 1 = 11$$
$$\Rightarrow 3x_2 = 6$$
$$\therefore x_2 = 2$$

Solving for x_1,

$$3x_1 + 6 \times 2 + 1 \times 1 = 16$$
$$\Rightarrow 3x_1 = 3$$
$$\therefore x_1 = 1$$

So, the solution is: $x_1 = 1, x_2 = 2, x_3 = 1$ Ans: