



Solution of Simultaneous Linear Equations Ex 8.1 Q4(i)

The above system can be written as

$$\begin{bmatrix} 2 & 5 \\ 6 & 15 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 13 \end{bmatrix}$$

or $A X = B$

$$|A| = 0$$

So, A is singular, and the above system will be inconsistent if

$$(\text{adj } A) \times B \neq 0$$

Now, $C_{11} = 15$

$$C_{12} = -6$$

$$C_{21} = -5$$

$$C_{22} = 2$$

$$\text{adj } A = \begin{bmatrix} 15 & -6 \\ -5 & 2 \end{bmatrix}^T = \begin{bmatrix} 15 & -5 \\ -6 & 2 \end{bmatrix}$$

$$\begin{aligned} (\text{adj } A) \times B &= \begin{bmatrix} 15 & -5 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} 7 \\ 13 \end{bmatrix} \\ &= \begin{bmatrix} 105 - 65 \\ -42 + 26 \end{bmatrix} \\ &= \begin{bmatrix} 40 \\ -16 \end{bmatrix} \\ &\neq 0 \end{aligned}$$

Hence, the above system is inconsistent

Solution of Simultaneous Linear Equations Ex 8.1 Q4(ii)

This system can be written as

$$\begin{bmatrix} 2 & 3 \\ 6 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 10 \end{bmatrix}$$

or $A X = B$

$$|A| = 0$$

So, the above system will be inconsistent, if

$$(\text{adj } A) \times B \neq 0$$

$$C_{11} = 9$$

$$C_{12} = -6$$

$$C_{21} = -3$$

$$C_{22} = 2$$

$$\text{adj } A = \begin{bmatrix} 9 & -6 \\ -3 & 2 \end{bmatrix}^T = \begin{bmatrix} 9 & -3 \\ -6 & 2 \end{bmatrix}$$

$$\begin{aligned} (\text{adj } A) \times B &= \begin{bmatrix} 9 & -3 \\ -6 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ 10 \end{bmatrix} \\ &= \begin{bmatrix} 45 - 30 \\ -30 + 20 \end{bmatrix} \\ &= \begin{bmatrix} 15 \\ -10 \end{bmatrix} \\ &\neq 0 \end{aligned}$$

Hence, the above system is inconsistent

Solution of Simultaneous Linear Equations Ex 8.1 Q4(iii)

This system can be written as

$$\begin{bmatrix} 4 & -2 \\ 6 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

or $A X = B$

$$|A| = -12 + 12 = 0$$

So, A is singular. Now system will be inconsistent, if

$$(\text{adj } A) \times B \neq 0$$

$$C_{11} = -3$$

$$C_{12} = -6$$

$$C_{21} = 2$$

$$C_{22} = 4$$

$$\text{adj } A = \begin{bmatrix} -3 & -6 \\ 2 & 4 \end{bmatrix}^T = \begin{bmatrix} -3 & 2 \\ -6 & 4 \end{bmatrix}$$

$$\begin{aligned} (\text{adj } A) \times (B) &= \begin{bmatrix} -3 & 2 \\ -6 & 4 \end{bmatrix} \begin{bmatrix} 3 \\ 5 \end{bmatrix} \\ &= \begin{bmatrix} -9 + 10 \\ -18 + 20 \end{bmatrix} \\ &= \begin{bmatrix} 1 \\ 2 \end{bmatrix} \\ &\neq 0 \end{aligned}$$

Hence, the above system is inconsistent

Solution of Simultaneous Linear Equations Ex 8.1 Q4(iv)

The above system can be written as

$$\begin{bmatrix} 4 & -5 & -2 \\ 5 & -4 & 2 \\ 2 & 2 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \\ -1 \end{bmatrix}$$

or $A X = B$

$$\begin{aligned} |A| &= 4(-36) + 5(36) - 2(18) \\ &= -144 + 180 - 36 \\ &= 0 \end{aligned}$$

So, A is singular and the above system will be inconsistent, if $(\text{adj } A) \times B \neq 0$

$$\begin{array}{lll} C_{11} = -36 & C_{21} = 36 & C_{31} = -18 \\ C_{12} = -36 & C_{22} = 36 & C_{32} = -18 \\ C_{13} = 18 & C_{23} = -18 & C_{33} = 9 \end{array}$$

$$(\text{adj } A) = \begin{bmatrix} -36 & -36 & 18 \\ 36 & 36 & -18 \\ -18 & -18 & 9 \end{bmatrix}^T = \begin{bmatrix} -36 & 36 & -18 \\ -36 & 36 & -18 \\ 18 & -18 & 9 \end{bmatrix}$$

$$(\text{adj } A) \times (B) = \begin{bmatrix} -36 & 36 & -18 \\ -36 & 36 & -18 \\ 18 & -18 & 9 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \\ -1 \end{bmatrix} = \begin{bmatrix} -72 - 72 + 18 \\ -72 - 72 + 18 \\ +36 + 36 - 9 \end{bmatrix} \neq 0$$

Hence, the above system is inconsistent.

Solution of Simultaneous Linear Equations Ex 8.1 Q4(v)

The above system can be written as

$$\begin{bmatrix} 3 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$$

or $A X = B$

$$|A| = 3(-5) + 1(3) - 2(-6) = -15 + 3 + 12 = 0$$

So, A is singular and the above system of equations will be inconsistent, if $(\text{adj } A) \times B \neq 0$

$$\begin{array}{lll} C_{11} = -5 & C_{21} = +10 & C_{31} = 5 \\ C_{12} = 3 & C_{22} = 6 & C_{32} = 3 \\ C_{13} = -6 & C_{23} = 12 & C_{33} = 6 \end{array}$$

$$(\text{adj } A) = \begin{bmatrix} -5 & 3 & -6 \\ 10 & 6 & 12 \\ 5 & 3 & 6 \end{bmatrix}^T = \begin{bmatrix} -5 & 10 & 5 \\ 3 & 6 & 3 \\ -6 & 12 & 6 \end{bmatrix}$$

$$(\text{adj } A) \times (B) = \begin{bmatrix} -5 & 10 & 5 \\ 3 & 6 & 3 \\ -6 & 12 & 6 \end{bmatrix} \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix} = \begin{bmatrix} -10 - 10 + 15 \\ 6 - 6 + 9 \\ -12 - 12 + 18 \end{bmatrix} \neq 0$$

Hence, the given system of equations is inconsistent.

Solution of Simultaneous Linear Equations Ex 8.1 Q4(vi)

The above system can be written as

$$\begin{bmatrix} 1 & 1 & -2 \\ 1 & -2 & 1 \\ -2 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ -2 \\ 4 \end{bmatrix}$$

or $A X = B$

$$|A| = 1(-3) - 1(3) - 2(-3) = -3 - 3 + 6 = 0$$

So, A is singular. Now the system can be inconsistent, if

$$(\text{adj } A) \times B \neq 0$$

$$C_{11} = -3 \quad C_{21} = -3 \quad C_{31} = -3$$

$$C_{12} = -3 \quad C_{22} = -3 \quad C_{32} = -3$$

$$C_{13} = -3 \quad C_{23} = -3 \quad C_{33} = -3$$

$$(\text{adj } A) = \begin{bmatrix} -3 & -3 & -3 \\ -3 & -3 & -3 \\ -3 & -3 & -3 \end{bmatrix}^T = \begin{bmatrix} -3 & -3 & -3 \\ -3 & -3 & -3 \\ -3 & -3 & -3 \end{bmatrix}$$

$$\begin{aligned} (\text{adj } A) \times B &= \begin{bmatrix} -3 & -3 & -3 \\ -3 & -3 & -3 \\ -3 & -3 & -3 \end{bmatrix} \begin{bmatrix} 5 \\ -2 \\ 4 \end{bmatrix} = \begin{bmatrix} -15+6-12 \\ -15+6-12 \\ -15+6-12 \end{bmatrix} \\ &= \begin{bmatrix} -21 \\ -21 \\ -21 \end{bmatrix} \\ &\neq 0 \end{aligned}$$

Hence, the given system is inconsistent.

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