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13020

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Q1)

(a) $x - 2y = 1$

$3x + y = 10$

Sol:-

$$\begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 10 \end{bmatrix}$$

$$AX = B$$

$$\Rightarrow A = \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 10 \end{bmatrix}$$

Now to find determinant of A

$$|A| = \begin{vmatrix} 1 & -2 \\ 3 & 1 \end{vmatrix}$$

$$|A| = (1)(1) - (-2)(3)$$

$$= 1 + 6$$

Q1 (a)

$|A| = 7$

$\Rightarrow |A| \neq 0$

By using Cramer's rule we have to find A_x

$$A_x = \begin{bmatrix} 1 & -2 \\ 10 & 1 \end{bmatrix}$$

To find determinant of A_x

$$|A_x| = \begin{vmatrix} 1 & -2 \\ 10 & 1 \end{vmatrix}$$

$$= (1)(1) - (-2)(10)$$

$$= 1 + 20$$

$$|A_x| = 21$$

Q1 (a)

Similarly to find A_y.

$$A_y = \begin{bmatrix} 1 & 1 \\ 3 & 10 \end{bmatrix}$$

$$|A_y| = \begin{vmatrix} 1 & 1 \\ 3 & 10 \end{vmatrix}$$

$$= (1)(10) - (3)(1)$$

$$= 10 - 3$$

$$|A_y| = 7$$

Now to find the values of x, y

$$x = \frac{|A_x|}{|A|} = \frac{21}{7} = 3$$

$$\boxed{x = 3}$$

(4)

Q1 (a)

$$y = \frac{|A_y|}{|A|}$$

$$y = \frac{7}{7} = 1$$

$$\boxed{y = 1}$$

$$(x, y) = (3, 1) \quad \text{Ans}$$

Q 1

(b) $x - 3y = 0$

$2y + y = 7$

Sol:- The matrix of the above system of linear equation is

$$\begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 7 \end{bmatrix}$$

$$\Rightarrow \quad AX = B \rightarrow (1)$$

Where

$$A = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 7 \end{bmatrix}$$

Now to find the determinant of A

$$|A| = \begin{vmatrix} 1 & -3 \\ 2 & 1 \end{vmatrix}$$

Q1 (b)

$|A| = (1)(1) - (2)(-3)$

$= 1 + 6$

$|A| = 7$

Since the determinant is non-zero

Thus the matrix A is non-singular.

Now to find the adjoint of A

So,

$$\text{Adj } A = \begin{bmatrix} 1 & 2 \\ -3 & 1 \end{bmatrix}$$

Now. By using inverse method

$$A^{-1} = \frac{\text{Adj } A}{|A|}$$

Q 1 (b)

$$\Rightarrow \quad A^{-1} = \frac{1}{7}\begin{bmatrix} 1 & 2 \\ -3 & 1 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 1/7 & 2/7 \\ -3/7 & 1/7 \end{bmatrix}$$

Now to find the values of x, y we have from eq (1)

$$AX = B$$

$$X = A^{-1}B$$

$$X = \begin{bmatrix} 1/7 & 2/7 \\ -3/7 & 1/7 \end{bmatrix}\begin{bmatrix} 0 \\ 7 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 + (2/7)(7) \\ 0 + (1/7)\ 7 \end{bmatrix}$$

(3)

Q1 (b)

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$\Rightarrow \boxed{x = 2, \quad y = 1}$$

Q 2:- Solve the Quadratic equations

(a) by using Factorization

(a) $4y^2 + 15y + 6 = 4y$

Sol:- $4y^2 + 15y - 4y + 6 = 0$

$\Rightarrow 4y^2 + 11y + 6 = 0$

$\Rightarrow 4y^2 + 8y + 3y + 6 = 0$

$\Rightarrow 4y(y+2) + 3(y+2) = 0$

$\Rightarrow (4y+3)(y+2) = 0$

$\Rightarrow 4y+3 = 0, \quad y+2 = 0$

$\Rightarrow 4y = -3, \quad y = -2$

Q 2:

$y = -3/4$, $y = -2$

$\Rightarrow$ S.S $= \{ -3/4, -2 \}$

(b) $x^2 + 15x = -50$

Sol:- $x^2 + 15x + 50 = 0$

By using factorization method

$\Rightarrow$ $x^2 + 5x + 10x + 50 = 0$

$\Rightarrow$ $x(x+5) + 10(x+5) = 0$

$\Rightarrow$ $(x+10)(x+5) = 0$

$\Rightarrow$ $x + 10 = 0$, $x + 5 = 0$

$\Rightarrow$ $x = -10$, $x = -5$

Q2.

$\Rightarrow$ S.S $= \{-10, -5\}$

(c) :- $y^2 = 6y + 27$

Sol :- $y^2 = 6y + 27$

$\Rightarrow y^2 - 6y - 27 = 0$

$\Rightarrow y^2 + 3y - 9y - 27 = 0$

$\Rightarrow y(y+3) - 9(y+3) = 0$

$\Rightarrow (y-9)(y+3) = 0$

$\Rightarrow y - 9 = 0, \quad y + 3 = 0$

(12)

$\Rightarrow$ $y = 9$, $y = -3$

$S.S = \{-3, 9\}$

(12).

Q3. Solve by Factorization

(a):- The Sum of two numbers is 27 and Their product is 50. Find the numbers.

Sol:- Let The one number is x.

Then The other number is $50/x$

Now according to the question

Sum $\Rightarrow$ $x + 50/x = 27$

$\Rightarrow$ $\frac{x^2 + 50}{x} = 27$

$\Rightarrow$ $x^2 + 50 = 27x$

$\Rightarrow$ $x^2 - 27x + 50 = 0$

$\Rightarrow$ $x^2 - 25x - 2x + 50 = 0$

Q3

$\Rightarrow x(x-25) - 2(x-25) = 0$

$\Rightarrow (x-2)(x-25) = 0$

$\Rightarrow x-2=0, \quad x-25=0$

$\Rightarrow x = 2, \quad x = 25$

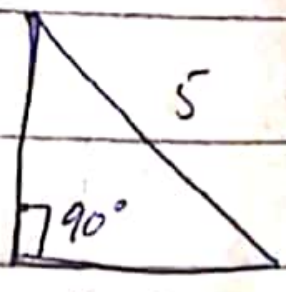
$\Rightarrow S.S = \{2, 25\}$

(b) The three sides of a right angled triangle are, x, $x+1$, and 5. Find x and the area, if the longest side is 5

Sol:-

By using Pythagoras Theorem

$x^2 + (x+1)^2 = (5)^2$



(15)

$\Rightarrow x^2 + x^2 + 2x + 1 = 25$

$\Rightarrow 2x^2 + 2x - 24 = 0$

$\Rightarrow x^2 + x - 12 = 0$ (Quadratic eq)

By factorizing the above eq we get

$\Rightarrow x^2 + 4x - 3x - 12 = 0$

$\Rightarrow x(x+4) - 3(x+4) = 0$

$\Rightarrow (x-3)(x+4) = 0$

$\Rightarrow x - 3 = 0, \quad x + 4 = 0$

$\Rightarrow$ $x = 3, \quad x = -4$

Since the side of a triangle never be -ve Thus $x = 3, x+1 = 4$

Now to find Area.

$$\text{Area} = \frac{1}{2}(a)(b)$$ Where a, b are Base and Perpendicular

$\Rightarrow$ $$\text{Area} = \frac{1}{2}(3)(4)$$

$\Rightarrow$ $$\text{Area} = \frac{1}{2}(12)$$

$\Rightarrow$ $$\text{Area} = 6\ cm^2$$