405.0

1. Consider the system of 2x2 equations x + 2y = 5 and 3x - 5y = -7. Solve the system of equations using inverse of a matrix.

Answer:

$$x + 2y = 5$$
$$3x - 5y = -7$$

$$\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -7 \end{bmatrix}$$

$$A \cdot X = B$$

$$A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$$

$$|A| = -5 - (6) = -11 \neq 0$$

So, inverse now

Cofactors :-

$$A^C = \begin{bmatrix} -5 & -3 \\ -2 & 1 \end{bmatrix}$$

$$adj(A) = \begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 5/11 & 2/11 \\ 3/11 & 1/11 \end{bmatrix}$$

$AA^{-1} =$ [illegible]

$\therefore \quad X = A^{-1} B$

$$= \begin{bmatrix} 5/11 & 2/11 \\ 3/11 & 1/11 \end{bmatrix} \begin{bmatrix} 5 \\ -7 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{25}{11} & -\frac{14}{11} \\ \frac{15}{4} & -\frac{7}{11} \end{bmatrix}$$

$$= \begin{bmatrix} 11/11 \\ 8/11 \end{bmatrix} = \begin{bmatrix} 1 \\ 8/11 \end{bmatrix}$$

$x = 1, \quad y = \frac{8}{11}$