

5.2.36

EE25BTECH11033 - Kavin

Question:

Solve the following system of linear equations.

$$3x - 5y - 4 = 0$$

$$9x = 2y + 7$$

Solution:

The equation of line L_1 is,

$$(3 \quad -5)\mathbf{x} = 4 \quad (1)$$

The equation of line L_2 is,

$$(9 \quad -2)\mathbf{x} = 7 \quad (2)$$

On putting the equations in a matrix, we will get

$$\Rightarrow \begin{pmatrix} 3 & -5 \\ 9 & -2 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 4 \\ 7 \end{pmatrix} \quad (3)$$

So the augmented matrix is,

$$\left(\begin{array}{cc|c} 3 & -5 & 4 \\ 9 & -2 & 7 \end{array} \right) \quad (4)$$

$$R_2 \rightarrow R_2 - 3R_1 \Rightarrow \left(\begin{array}{cc|c} 3 & -5 & 4 \\ 0 & 13 & -5 \end{array} \right) \quad (5)$$

$$R_2 \rightarrow \frac{1}{13}R_2 \Rightarrow \left(\begin{array}{cc|c} 3 & -5 & 4 \\ 0 & 1 & -5/13 \end{array} \right) \quad (6)$$

$$R_1 \rightarrow R_1 + 5R_2 \Rightarrow \left(\begin{array}{cc|c} 3 & 0 & 27/13 \\ 0 & 1 & -5/13 \end{array} \right) \quad (7)$$

$$R_1 \rightarrow \frac{1}{3}R_1 \Rightarrow \left(\begin{array}{cc|c} 1 & 0 & 9/13 \\ 0 & 1 & -5/13 \end{array} \right) \quad (8)$$

$$\Rightarrow \mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix} \equiv \begin{pmatrix} 9/13 \\ -5/13 \end{pmatrix} \quad (9)$$

Therefore the two lines will intersect at $\begin{pmatrix} 9/13 \\ -5/13 \end{pmatrix}$.

