

4.2.28

EE25BTECH11025 - Ganachari Vishwambhar

Question:

Solve the system of linear equations:

$$5x - 8y = -1 \quad (1)$$

$$3x - \frac{24}{5}y = \frac{-3}{5} \quad (2)$$

Solution:

Given:

$$\begin{pmatrix} 5 & -8 \end{pmatrix} \mathbf{x} = -1; \begin{pmatrix} 3 & \left(\frac{-24}{5}\right) \end{pmatrix} \mathbf{x} = \frac{-3}{5} \quad (3)$$

$$A = \begin{pmatrix} 5 & -8 \\ 3 & \left(\frac{-24}{5}\right) \end{pmatrix}; \mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix}; \mathbf{b} = \begin{pmatrix} -1 \\ \left(\frac{-3}{5}\right) \end{pmatrix} \quad (4)$$

$$A\mathbf{x} = \mathbf{b} \quad (5)$$

Let:

Rank of coefficient matrix = r

Rank of Augmented matrix = r_a

Order of coefficient matrix = n

Augmented Matrix:

$$\left(\begin{array}{cc|c} 5 & -8 & -1 \\ 3 & \left(\frac{-24}{5}\right) & \left(\frac{-3}{5}\right) \end{array} \right) \quad (6)$$

$$R_2 \rightarrow R_2 - \frac{3}{5}R_1 \quad (7)$$

$$\left(\begin{array}{cc|c} 5 & -8 & -1 \\ 0 & 0 & 0 \end{array} \right) \quad (8)$$

$$r = 1; r_a = 1; n = 2 \quad (9)$$

$$\therefore r = r_a < n \quad (10)$$

Infinite solutions exist for the given system of linear equations.

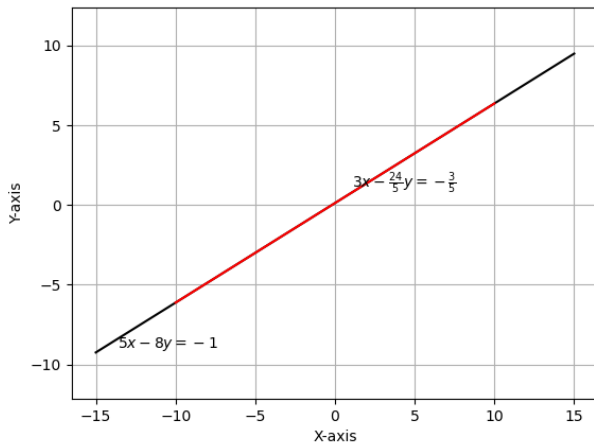


Fig. 1: Plot of the given system of lines