

Assignment No.4

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Download all python codes from

<https://github.com/sravani706/Assignment-4.git>

and latex-tikz codes from

<https://github.com/sravani706/Assignment-4.git>

Question taken from

https://github.com/gadepall/ncert/blob/main/linalg/linear_forms/gvv_ncert_linear_forms.pdf

1 LINEAR FORMS EXERCISE 2.5(B)

Find out whether the following pair of linear equations are consistent, or inconsistent.

$$\begin{pmatrix} 2 & -3 \end{pmatrix} \mathbf{x} = 8 \quad (1.0.1)$$

$$\begin{pmatrix} 4 & -6 \end{pmatrix} \mathbf{x} = 9 \quad (1.0.2)$$

2 SOLUTION

$$\begin{pmatrix} 2 & -3 \end{pmatrix} \mathbf{x} = 8 \quad (2.0.1)$$

$$\begin{pmatrix} 4 & -6 \end{pmatrix} \mathbf{x} = 9 \quad (2.0.2)$$

The above equations can be expressed as the matrix equation

$$\begin{pmatrix} 2 & -3 \\ 4 & -6 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 8 \\ 9 \end{pmatrix} \quad (2.0.3)$$

The augmented matrix for the above equation is row reduced as follows:

$$\left(\begin{array}{cc|c} 2 & -3 & 8 \\ 4 & -6 & 9 \end{array} \right) \xrightarrow{R_1 \leftarrow R_1 + 3} \left(\begin{array}{cc|c} 5 & 0 & 11 \\ 4 & -6 & 9 \end{array} \right) \quad (2.0.4)$$

$$\xrightarrow{R_1 \leftarrow \frac{R_1}{5}} \left(\begin{array}{cc|c} 1 & 0 & \frac{11}{5} \\ 4 & -6 & 9 \end{array} \right) \quad (2.0.5)$$

$$\xrightarrow{R_2 \leftarrow R_2 - 4} \left(\begin{array}{cc|c} 1 & 0 & \frac{11}{5} \\ 0 & -10 & 5 \end{array} \right) \quad (2.0.6)$$

$$\xrightarrow{R_2 \leftarrow \frac{R_2}{-10}} \left(\begin{array}{cc|c} 1 & 0 & \frac{11}{5} \\ 0 & -1 & -\frac{1}{2} \end{array} \right) \quad (2.0.7)$$

$$\xrightarrow{R_2 \leftarrow R_1 - R_2} \left(\begin{array}{cc|c} 1 & 0 & \frac{11}{5} \\ 1 & 1 & \frac{17}{10} \end{array} \right) \quad (2.0.8)$$

$$\xrightarrow{R_2 \leftarrow R_2 - 1} \left(\begin{array}{cc|c} 1 & 0 & \frac{11}{5} \\ 0 & 1 & \frac{7}{10} \end{array} \right) \quad (2.0.9)$$

So by reduction of the (2×3) matrix

$$\left(\begin{array}{cc|c} 2 & -3 & 8 \\ 4 & -6 & 9 \end{array} \right) \quad (2.0.10)$$

Rank of augmented matrix is 2.

$$\left(\begin{array}{cc|c} 2 & -3 \\ 4 & -6 \end{array} \right) \quad (2.0.11)$$

The rank of the above matrix is 1.

Hence the rank of two matrix are not equal
 \therefore lines are Inconsistent.

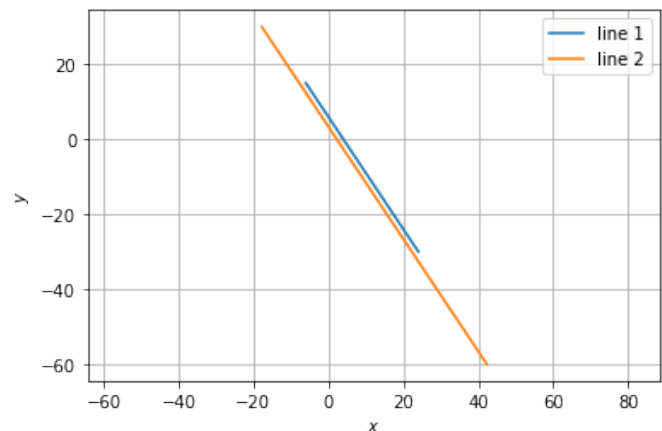


Fig. 2.1: Graphical solution

\therefore This figure verifies that two lines are not intersecting at one point.