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.

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

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

2 Solution

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

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

The above equations can be expressed as the matrix equation

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

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

$$\begin{pmatrix}2 & -3 & 8\\4 & -6 & 9\end{pmatrix} \xleftrightarrow{R_1 \leftarrow R_1+3} \begin{pmatrix}5 & 0 & 11\\4 & -6 & 9\end{pmatrix} \tag{2.0.4}$$

$$\xleftrightarrow{R_1 \leftarrow \frac{R_1}{5}} \begin{pmatrix}1 & 0 & \frac{11}{5}\\4 & -6 & 9\end{pmatrix} \tag{2.0.5}$$

$$\xleftrightarrow{R_2 \leftarrow R_2-4} \begin{pmatrix}1 & 0 & \frac{11}{5}\\0 & -10 & 5\end{pmatrix} \tag{2.0.6}$$

$$\xleftrightarrow{R_2 \leftarrow \frac{R_2}{10}} \begin{pmatrix}1 & 0 & \frac{11}{5}\\0 & -1 & \frac{5}{10}\end{pmatrix} \tag{2.0.7}$$

$$\xleftrightarrow{R_2 \leftarrow R_1-R_2} \begin{pmatrix}1 & 0 & \frac{11}{5}\\1 & 1 & \frac{17}{10}\end{pmatrix} \tag{2.0.8}$$

$$\xleftrightarrow{R_2 \leftarrow R_2-1} \begin{pmatrix}1 & 0 & \frac{11}{5}\\0 & 0 & \frac{7}{10}\end{pmatrix} \tag{2.0.9}$$

So by reduction of the (2×3) matrix

$$\begin{pmatrix}2 & -3 & 8\\4 & -6 & 9\end{pmatrix} \tag{2.0.10}$$

Rank of augmented matrix is 2.

$$\begin{pmatrix}2 & -3\\4 & -6\end{pmatrix} \tag{2.0.11}$$

The rank of the above matrix is 1.
Hence the rank of two matrix are not equal
$\therefore$ lines are Inconsistent.

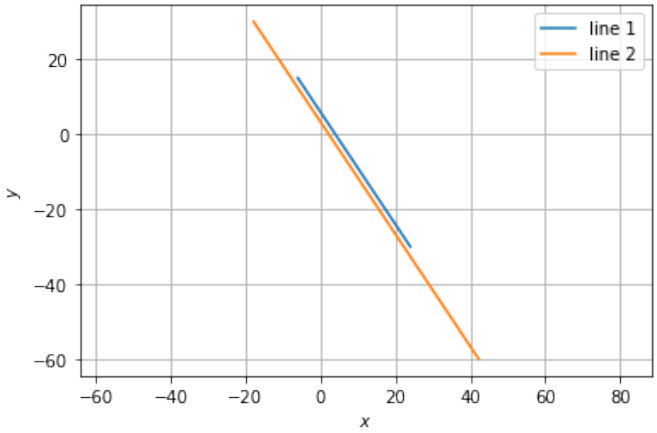

Fig. 2.1: Graphical solution

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