Assignment No.4

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Download all python codes from

https://github.com/Padmanabhk1/Assignment−4.git

and latex-tikz codes from

https://github.com/Padmanabhk1/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(a)

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

$$\begin{pmatrix}5 & -3\end{pmatrix}\mathbf{x} = 11 \tag{1.0.1}$$

$$\begin{pmatrix}-10 & 6\end{pmatrix}\mathbf{x} = -22 \tag{1.0.2}$$

2 Solution

$$\begin{pmatrix}5 & -3\end{pmatrix}\mathbf{x} = 11 \tag{2.0.1}$$

$$\begin{pmatrix}-10 & 6\end{pmatrix}\mathbf{x} = -22 \tag{2.0.2}$$

The above equations can be expressed as the matrix equation

$$\begin{pmatrix}5 & -3\\ -10 & 6\end{pmatrix}\mathbf{x} = \begin{pmatrix}11\\ -22\end{pmatrix} \tag{2.0.3}$$

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

$$\begin{pmatrix}5 & -3 & 11\\ -10 & 6 & -22\end{pmatrix} \xleftrightarrow{R_1 \leftarrow \frac{1}{5}R_1} \begin{pmatrix}1 & \frac{-3}{5} & \frac{11}{5}\\ -10 & 6 & -22\end{pmatrix} \tag{2.0.4}$$

$$\xleftrightarrow{R_2 \leftarrow 10R_1 + R_2} \begin{pmatrix}1 & \frac{-3}{5} & \frac{11}{5}\\ 0 & 0 & 0\end{pmatrix} \tag{2.0.5}$$

So by reduction of the (2×3) matrix

$$\begin{pmatrix}5 & -3 & 11\\ -10 & 6 & -22\end{pmatrix} \tag{2.0.6}$$

gives matrix with 2 nonzero row, So it's rank is 1.

$$\begin{pmatrix}5 & -3\\ -10 & 6\end{pmatrix} \tag{2.0.7}$$

Also,the rank of the above matrix is also 1.

$\therefore$ lines are Consistent and gives infinite solution.

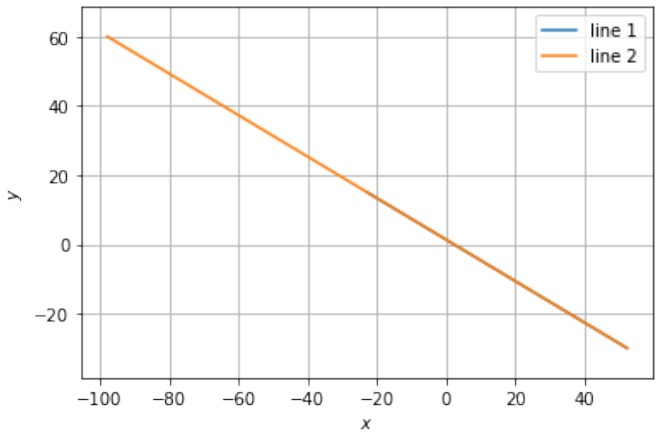

Fig. 2.1: Graphical solution

$\therefore$ This figure verifies that two lines are intersecting at one point.