Assignment-04

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Download all python codes from

https://github.com/suyogtangade/Assignment4.git

and latex-tikz codes from

https://github.com/suyogtangade/Assignment4.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(c)

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

$$\begin{pmatrix}\frac{4}{3} & 2\mathbf{x}\end{pmatrix} = 8 \tag{1.0.1}$$

$$\begin{pmatrix}2 & 3\end{pmatrix}\mathbf{x} = 12 \tag{1.0.2}$$

2 Solution

$$\begin{pmatrix}\frac{4}{3} & 2\mathbf{x}\end{pmatrix} = 8 \tag{2.0.1}$$

$$\begin{pmatrix}2 & 3\end{pmatrix}\mathbf{x} = 12 \tag{2.0.2}$$

The above equations can be expressed as the matrix equation

$$\begin{pmatrix}\frac{4}{3} & 2\\ 2 & 3\end{pmatrix}\mathbf{x} = \begin{pmatrix}8\\12\end{pmatrix} \tag{2.0.3}$$

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

$$\begin{pmatrix}\frac{4}{3} & 2 & 8\\ 2 & 3 & 12\end{pmatrix} \xleftrightarrow{R_1 \leftarrow \frac{3}{4}R_1} \begin{pmatrix}1 & \frac{3}{2} & 6\\ 2 & 3 & 12\end{pmatrix} \tag{2.0.4}$$

$$\xleftrightarrow{R_2 \leftarrow R_2 - 2R_1} \begin{pmatrix}1 & \frac{3}{2} & 6\\ 0 & 0 & 0\end{pmatrix} \tag{2.0.5}$$

So by reduction of the (2×3) matrix

$$\begin{pmatrix}\frac{4}{3} & 2 & 8\\ 2 & 3 & 12\end{pmatrix} \tag{2.0.6}$$

gives matrix with 2 non zero row,so i'ts rank is 1.

$$\begin{pmatrix}\frac{4}{3} & 2\\ 2 & 3\end{pmatrix} \tag{2.0.7}$$

The rank of the above matrix is also 1.

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

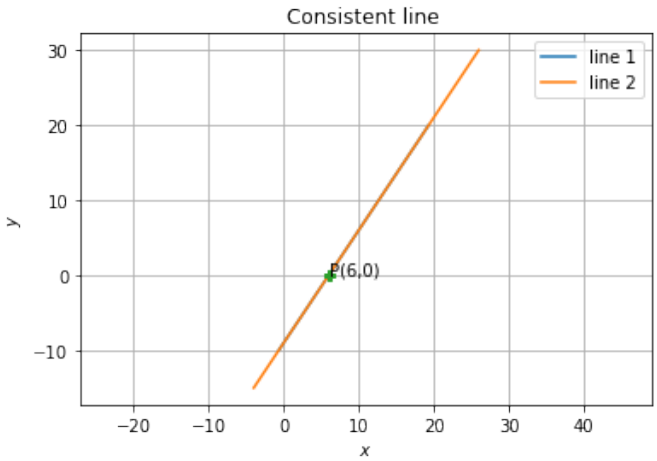

Fig. 2.1: Graphical solution

$\therefore$ This figure verifies that two lines are intersecting at point P = $\begin{pmatrix}6\\0\end{pmatrix}$.