

Assignment-03

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Download all python codes from

<https://github.com/MVKKanth/Assignment4.git>

and latex-tikz codes from

<https://github.com/MVKKanth/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(E)

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

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

$$\begin{pmatrix} 2 & 3 \end{pmatrix} \mathbf{x} = 12 \quad (1.0.2)$$

2 SOLUTION

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

$$\begin{pmatrix} 2 & 3 \end{pmatrix} \mathbf{x} = 12 \quad (2.0.2)$$

The above equations can be expressed as the matrix equation

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

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

$$\left(\begin{array}{cc|c} \frac{4}{3} & 2 & 8 \\ 2 & 3 & 12 \end{array} \right) \xrightarrow{R_1 \leftarrow \frac{3}{4}R_1} \left(\begin{array}{cc|c} 1 & \frac{3}{2} & 6 \\ 2 & 3 & 12 \end{array} \right) \quad (2.0.4)$$

$$\xrightarrow{R_2 \leftarrow R_2 - 2R_1} \left(\begin{array}{cc|c} 1 & \frac{3}{2} & 6 \\ 0 & 0 & 0 \end{array} \right) \quad (2.0.5)$$

So by reduction of the (2×3) matrix

$$\begin{pmatrix} \frac{4}{3} & 2 & 8 \\ 2 & 3 & 12 \end{pmatrix} \quad (2.0.6)$$

gives matrix with 2 non zero row, so its rank is 1.

$$\begin{pmatrix} \frac{4}{3} & 2 \\ 2 & 3 \end{pmatrix} \quad (2.0.7)$$

The rank of the above matrix is also 1.

\therefore lines are Consistent and gives infinite solutions.

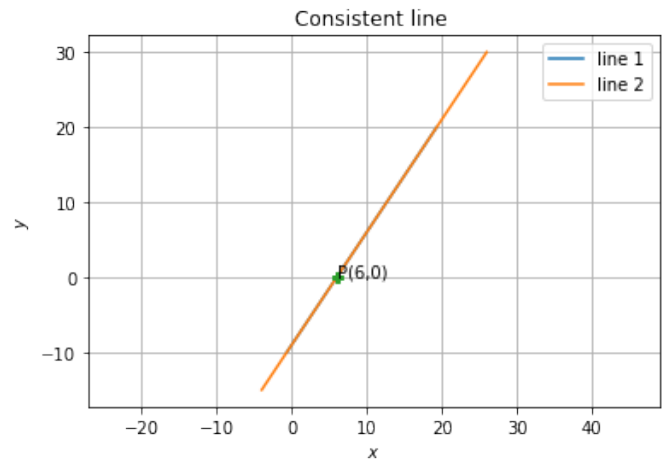


Fig. 2.1: Graphical solution

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