ASSIGNMENT 2

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Download all python codes from

https://github.com/Ravalika1630/Assignment2/tree/main/CODES

and latex-tikz codes from

https://github.com/Ravalika1630/Assignment2/blob/main/Assignment2.text

1 Question No 2.10

Find the intersection of the following lines?

1)

$$\begin{pmatrix}3 & -1\end{pmatrix}\mathbf{x} = 3$$
$$\begin{pmatrix}9 & -3\end{pmatrix}\mathbf{x} = 9 \tag{1.0.1}$$

2)

$$\begin{pmatrix}0.2 & 0.3\end{pmatrix}\mathbf{x} = 1.3$$
$$\begin{pmatrix}0.4 & 0.5\end{pmatrix}\mathbf{x} = 2.3 \tag{1.0.2}$$

2 SOLUTION

1)

$$\begin{pmatrix}3 & -1\end{pmatrix}\mathbf{x} = 3$$
$$\begin{pmatrix}9 & -3\end{pmatrix}\mathbf{x} = 9 \tag{2.0.1}$$

The above equations can be expressed as the matrix equation

$$\begin{pmatrix}3 & -1\\9 & -3\end{pmatrix}\mathbf{x} = \begin{pmatrix}3\\9\end{pmatrix} \tag{2.0.2}$$

Now we converted these matrix equation in augmented matrix form using row reduction

$$\begin{pmatrix}3 & -1 & 3\\9 & -3 & 9\end{pmatrix} \xleftrightarrow{R_2 \to \frac{R_2}{3}} \begin{pmatrix}3 & -1 & 3\\3 & -1 & 3\end{pmatrix} \tag{2.0.3}$$

As R_1=R_2, left part can never be converted into a identity matrix,and we can see now both row are same that means both lines are same they intersect at infinitely many points.

PLOT OF GIVEN LINES -

Plot of (1.0.1) -

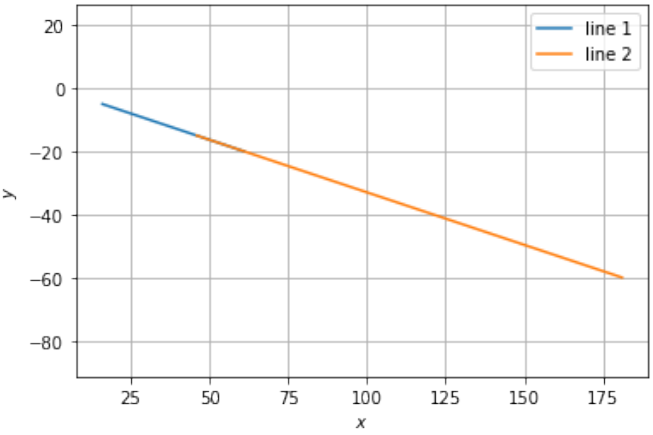

Fig. 2.1: SAME-LINES

2)

$$\begin{pmatrix}0.2 & 0.3\end{pmatrix}\mathbf{x} = 1.3$$
$$\begin{pmatrix}0.4 & 0.5\end{pmatrix}\mathbf{x} = 2.3 \tag{2.0.4}$$

The above equations can be expressed as the matrix equation

$$\begin{pmatrix}0.2 & 0.3\\0.4 & 0.5\end{pmatrix}\mathbf{x} = \begin{pmatrix}1.3\\1.4\end{pmatrix} \tag{2.0.5}$$

Now we converted these matrix equation in augmented matrix form using row reduction

$$\begin{pmatrix}0.2 & 0.3 & 1.3\\0.4 & 0.5 & 1.4\end{pmatrix} \xleftrightarrow{R_2 \to R_2 - 2R_1} \begin{pmatrix}0.2 & 0.3 & 1.3\\0 & -0.1 & -0.3\end{pmatrix} \tag{2.0.6}$$

$$\xleftrightarrow{R_2 \to \frac{R_2}{-0.1}} \begin{pmatrix}0.2 & 0.3 & 1.3\\0 & 1 & 3\end{pmatrix} \tag{2.0.7}$$

$$\xleftrightarrow{R_1 \to R_1 - 0.3R_2} \begin{pmatrix}0.2 & 0 & 0.4\\0 & 1 & 3\end{pmatrix} \tag{2.0.8}$$

$$\xleftrightarrow{R_1 \to \frac{R_1}{0.2}} \begin{pmatrix}1 & 0 & 2\\0 & 1 & 3\end{pmatrix} \tag{2.0.9}$$

As left part is converted into identity matrix the intersection vector is $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

PLOT OF GIVEN LINES -

Plot of (1.0.2) -

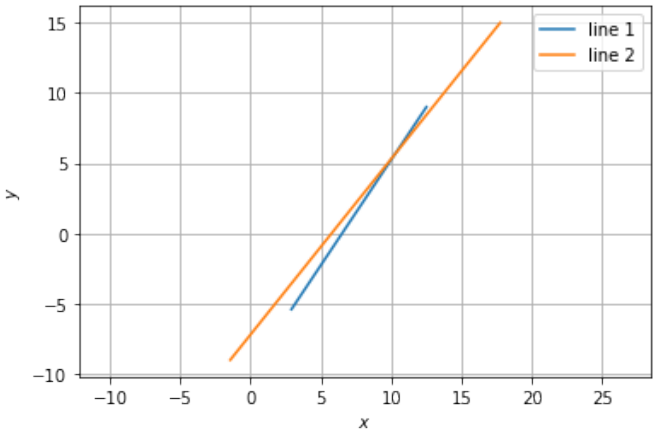

Fig. 2.2: INTERSECTING-LINES