

# 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/Assignment%202.tex>

## 1 QUESTION No 2.10

Find the intersection of the following lines?

1)

$$\begin{aligned} (3 \quad -1)\mathbf{x} &= 3 \\ (9 \quad -3)\mathbf{x} &= 9 \end{aligned} \quad (1.0.1)$$

2)

$$\begin{aligned} (0.2 \quad 0.3)\mathbf{x} &= 1.3 \\ (0.4 \quad 0.5)\mathbf{x} &= 2.3 \end{aligned} \quad (1.0.2)$$

## 2 SOLUTION

1)

$$\begin{aligned} (3 \quad -1)\mathbf{x} &= 3 \\ (9 \quad -3)\mathbf{x} &= 9 \end{aligned} \quad (2.0.1)$$

The above equations can be expressed as the matrix equation

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

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

$$\begin{pmatrix} 3 & -1 & 3 \\ 9 & -3 & 9 \end{pmatrix} \xrightarrow{R_2 \rightarrow \frac{R_2}{3}} \begin{pmatrix} 3 & -1 & 3 \\ 3 & -1 & 3 \end{pmatrix} \quad (2.0.3)$$

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) -

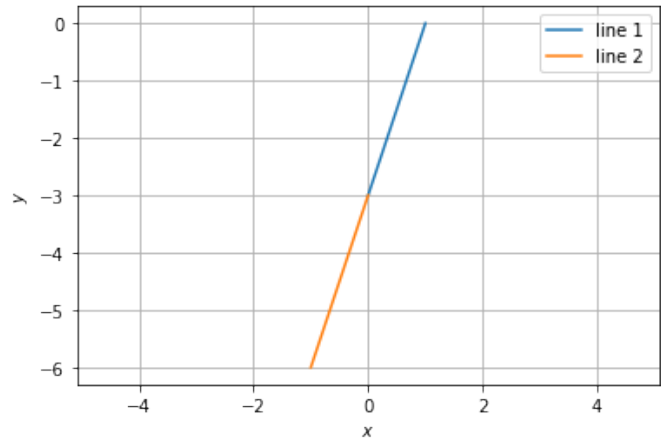


Fig. 2.1: SAME-LINES

2)

$$\begin{aligned} (0.2 \quad 0.3)\mathbf{x} &= 1.3 \\ (0.4 \quad 0.5)\mathbf{x} &= 2.3 \end{aligned} \quad (2.0.4)$$

The above equations can be expressed as the matrix equation

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

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

$$\begin{pmatrix} 0.2 & 0.3 & 1.3 \\ 0.4 & 0.5 & 1.4 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2 - 2R_1} \begin{pmatrix} 0.2 & 0.3 & 1.3 \\ 0 & -0.1 & -0.3 \end{pmatrix} \quad (2.0.6)$$

$$\xrightarrow{R_2 \rightarrow \frac{R_2}{-0.1}} \begin{pmatrix} 0.2 & 0.3 & 1.3 \\ 0 & 1 & 3 \end{pmatrix} \quad (2.0.7)$$

$$\xrightarrow{R_1 \rightarrow R_1 - 0.3R_2} \begin{pmatrix} 0.2 & 0 & 0.4 \\ 0 & 1 & 3 \end{pmatrix} \quad (2.0.8)$$

$$\xrightarrow{R_1 \rightarrow \frac{R_1}{0.2}} \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{pmatrix} \quad (2.0.9)$$

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) -

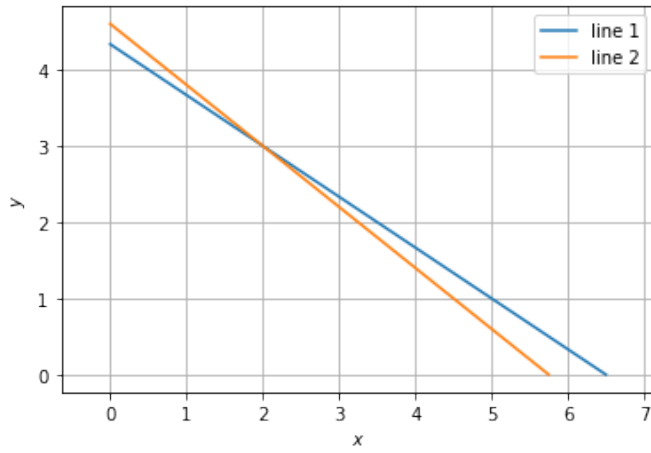


Fig. 2.2: INTERSECTING-LINES