

# Assignment - 1

sravani snadya  
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**Abstract—**This is a simple document to learn about writing vectors and matrices using latex, draw figures using Python, Latex.

Download all and latex-tikz codes from

svn co [https://github.com/sravani706/Assignment-1\\_new.git](https://github.com/sravani706/Assignment-1_new.git)

## 1 VECTORS

(CBSE-MATH-X-200830/2/2-Q.23)

1.1. Represent the following points of equation graphically:

$$x - 3y - 6 = 0 \quad (1.1.1)$$

$$\text{or } \begin{pmatrix} 1 & -3 \end{pmatrix} \mathbf{y} = 6 \quad (1.1.2)$$

$$2x - 3y - 12 = 0 \quad (1.1.3)$$

$$\text{or } \begin{pmatrix} 2 & -3 \end{pmatrix} \mathbf{x} = 12 \quad (1.1.4)$$

and write the coordinates of points when the line intersects y axis .

**Solution:**

a) We have equations of two lines: Which is written in vector form:

$$\begin{pmatrix} 1 & -3 \end{pmatrix} \mathbf{x} = 6 \quad (1.1.5)$$

and

$$\begin{pmatrix} 2 & -3 \end{pmatrix} \mathbf{x} = 12 \quad (1.1.6)$$

where

$$\mathbf{y} = \begin{pmatrix} x \\ y \end{pmatrix} \quad (1.1.7)$$

Both equations are written together in matrix form as:

$$\begin{pmatrix} 1 & -3 \\ 2 & -3 \end{pmatrix} \mathbf{y} = \begin{pmatrix} 6 \\ 12 \end{pmatrix} \quad (1.1.8)$$

Augmented matrix for above is:

$$\begin{pmatrix} 1 & -3 & 6 \\ 2 & -3 & 12 \end{pmatrix} \quad (1.1.9)$$

This can be reduced as follows:

$$\begin{array}{l} \xrightarrow{R_2 \leftarrow R_2 - R_1} \\ \begin{pmatrix} 1 & -3 & 6 \\ 3 & 0 & 18 \end{pmatrix} \\ \xrightarrow{R_1 \leftarrow \frac{3R_1 - R_2}{3}} \\ \begin{pmatrix} 0 & 9 & 18 \\ 3 & 0 & 18 \end{pmatrix} \\ \xrightarrow{R_2 \leftarrow \frac{R_2}{3}} \\ \begin{pmatrix} 0 & 9 & 18 \\ 1 & 0 & 6 \end{pmatrix} \\ \xrightarrow{r_1 \leftarrow \frac{R_1}{9}} \\ \begin{pmatrix} 0 & 1 & 2 \\ 1 & 0 & 6 \end{pmatrix} \end{array}$$

$$\therefore \mathbf{P} = \begin{pmatrix} 2 \\ 6 \end{pmatrix} \quad (1.1.10)$$

is the point of intersection of the line and forms coordinates on y-axis.

b) To find out intersection of (1.1.5) with the y axis:

equation of y axis is

$$\begin{pmatrix} 0 & 1 \end{pmatrix} \mathbf{y} = 0 \quad (1.1.11)$$

we have 2 equations:

$$\begin{pmatrix} 1 & -3 \end{pmatrix} \mathbf{y} = 6 \quad (1.1.12)$$

$$\begin{pmatrix} 0 & 1 \end{pmatrix} \mathbf{y} = 0 \quad (1.1.13)$$

Augmented matrix for above is:

$$\begin{pmatrix} 1 & -3 & 6 \\ 0 & 1 & 0 \end{pmatrix} \quad (1.1.14)$$

This can be reduced as follows:

$$\begin{pmatrix} 1 & 0 & 6 \\ 0 & 1 & 0 \end{pmatrix}$$

$$\therefore \mathbf{Q} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (1.1.15)$$

is the point of intersection of the line (1.1.5) with the y axis.

- c) To find out intersection of (1.1.6) with the y axis:  
equation of y axis is

$$\begin{pmatrix} 0 & 1 \end{pmatrix} \mathbf{y} = 0 \quad (1.1.16)$$

we have 2 equations:

$$\begin{pmatrix} 2 & -3 \end{pmatrix} \mathbf{y} = 12 \quad (1.1.17)$$

$$\begin{pmatrix} 0 & 1 \end{pmatrix} \mathbf{y} = 0 \quad (1.1.18)$$

Augmented matrix for above is:

$$\begin{pmatrix} 2 & -3 & 12 \\ 0 & 1 & 0 \end{pmatrix} \quad (1.1.19)$$

This can be reduced as follows:

$$\begin{array}{ccc} 2 & 0 & 12 \\ 0 & 1 & 0 \end{array} \xrightarrow{R_1 \leftarrow \frac{R_1}{2}} \begin{pmatrix} 1 & 0 & 6 \\ 0 & 1 & 0 \end{pmatrix}$$

$$\mathbf{R} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (1.1.20)$$

is the point of intersection of the line (1.1.6) with the y axis.

$$\mathbf{P} = \begin{pmatrix} 2 \\ 6 \end{pmatrix} \quad (1.1.21)$$

$$\mathbf{Q} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (1.1.22)$$

$$\mathbf{R} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (1.1.23)$$

$$(1.1.24)$$

represent the coordinates of line intersecting y axis