Assignment - 1 New Edited

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

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1 VECTORS

1.1. Draw the graphs of the following equations:

$$3x - 4y + 6 = 0$$

$$3x + y - 9 = 0$$

Also determine the co-ordinates of the vertices of the triangle formed by these lines and the x-axis.

Solution:

We have two equations of lines in 2D:

$$3x - 4y + 6 = 0 \tag{1.1.1}$$
$$3x + y - 9 = 0 \tag{1.1.2}$$

Which can be written as: $\begin{bmatrix} 3 & -4 \\ 3 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -6 \\ 9 \end{bmatrix}$

Augmented matrix for above is:

$$\begin{pmatrix} 3 & -4 & -6 \\ 3 & 1 & 9 \end{pmatrix} \tag{1.1.3}$$

This can be reduced as follows:

$$\begin{pmatrix} 3 & -4 & -6 \\ 3 & 1 & 9 \end{pmatrix} \xrightarrow[R_1 \leftarrow R_2]{R_2 \leftarrow R_1} \begin{pmatrix} 3 & 1 & 9 \\ 3 & -4 & -6 \end{pmatrix} \tag{1.1.4}$$

$$\xrightarrow{R_1 \leftarrow \frac{R_1}{3}} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 3 & -4 & -6 \end{pmatrix} \tag{1.1.5}$$

$$\xrightarrow{R_2 \leftarrow R_2 - 3R_1} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 0 & -5 & -15 \end{pmatrix} \tag{1.1.6}$$

$$\xrightarrow{R_2 \leftarrow \frac{1}{5}R_2} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 0 & 1 & 3 \end{pmatrix} \tag{1.1.7}$$

$$\xrightarrow{R_1 \leftarrow R_1 - \frac{1}{3}R_2} \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{pmatrix} \tag{1.1.8}$$

Thus,

$$x = 2, y = 3 \tag{1.1.9}$$

is the solution for the two equations.

$$P = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{1.1.10}$$

is the point of intersection of the lines and the vertex of the triangle formes by the two lines with x-axis as base.

In equation 1,

$$y = \frac{3x + 6}{9} \tag{1.1.11}$$

Substituting for y = 0, we get x = -2.

$$\therefore Q = \begin{pmatrix} 2 \\ 0 \end{pmatrix} \tag{1.1.12}$$

represents point of the line on x-axis.

In equation 2,

$$y = 3x - 9 \tag{1.1.13}$$

Substituting for y = 0, we get x = 6

$$\therefore R = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \tag{1.1.14}$$
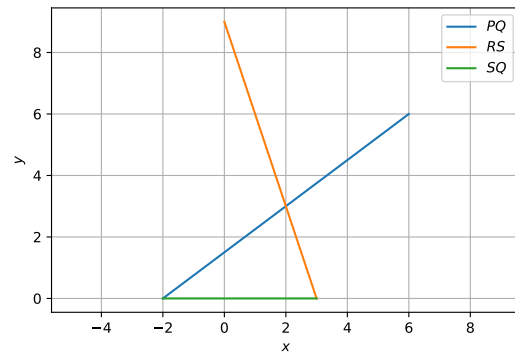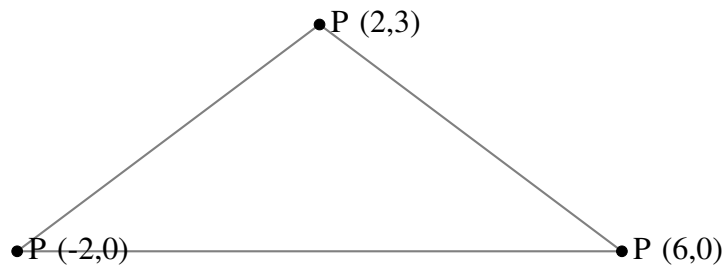
represents point of the line on x-axis.

Fig. 1.1. Two lines representing given equations meet at point $\begin{pmatrix} 2 & 3 \end{pmatrix}$
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•P (2,3)

•P (-2,0)

•P (6,0)

Tikz-Diagram

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