Assignment - 1 New Edited

Arjun Jayachandran
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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

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svn co https://github.com/arjunjc93/Assignment-1_new.git
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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:**

a) We have two equations of lines in 2D:
   i) 3x-4y+6=0
   ii) 3x+y-9=0

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

c) Augmented matrix for above is:

$$\begin{pmatrix} 3 & -4 & -6 \\ 3 & 1 & 9 \end{pmatrix} \tag{1.1.1}$$

d) This can be reduced as follows:
   i) $\begin{pmatrix} 3 & -4 & -6 \\ 3 & 1 & 9 \end{pmatrix}$
   ii) $\overset{\substack{R_2 \leftarrow R_1 \\ R_1 \leftarrow R_2}}{\longleftrightarrow} \begin{pmatrix} 3 & 1 & 9 \\ 3 & -4 & -6 \end{pmatrix}$
   iii) $\overset{R_1 \leftarrow \frac{R_1}{3}}{\longleftrightarrow} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 3 & -4 & -6 \end{pmatrix}$
   iv) $\overset{R_2 \leftarrow R_2 - 3R_1}{\longleftrightarrow} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 0 & -5 & -15 \end{pmatrix}$
   v) $\overset{R_2 \leftarrow \frac{1}{5}R_2}{\longleftrightarrow} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 0 & 1 & 3 \end{pmatrix}$
   vi) $\overset{R_1 \leftarrow R_1 - \frac{1}{3}R_2}{\longleftrightarrow} \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{pmatrix}$

e) Thus,

$$x = 2, y = 3 \tag{1.1.2}$$

is the solution for the two equations.

f) Let this point be P

$$\therefore P = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \tag{1.1.3}$$

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

g) In equation 1,
   i)

$$y = \frac{3x + 6}{9} \tag{1.1.4}$$

   ii) Substituting for y = 0, we get x = -2. Let this point be Q.

$$\therefore Q = \begin{pmatrix} -2 \\ 0 \end{pmatrix} \tag{1.1.5}$$

   represents point of the line on x-axis.

h) In equation 2,
   i)

$$y = 3x - 9 \tag{1.1.6}$$

   i) Substituting for y = 0, we get x = 6. Let this point be R.

$$\therefore R = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \tag{1.1.7}$$

   represents point of the line on x-axis.

i) i) P, Q and R represent the vertices of the triangle formed by the lines

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

$$x + y - 9 = 0$$

with the X-axis.

ii) A) P is the vertex of the triangle.
B) Q is the point at which $3x-4y+6=0$ meets the X-axis.
C) R is the point at which $3x+y-9=0$ meets the X-axis.

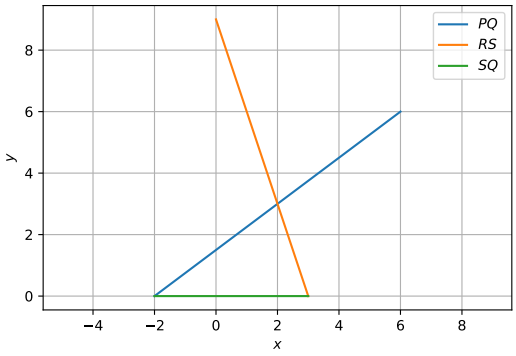

Fig. 1.1. Two lines representing given equations meet at point $\begin{pmatrix}2 & 3\end{pmatrix}$

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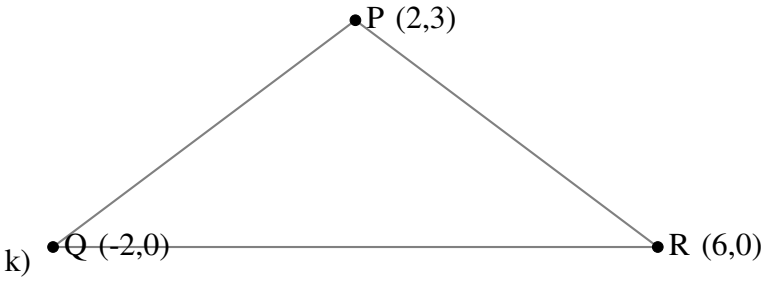
j)



k)

Tikz-Diagram