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.**

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 equations of two lines:
   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) $\xleftrightarrow[R_1\leftarrow R_2]{R_2\leftarrow R_1} \begin{pmatrix}3 & 1 & 9\\3 & -4 & -6\end{pmatrix}$
   iii) $\xleftrightarrow{R_1\leftarrow \frac{R_1}{3}} \begin{pmatrix}1 & \frac{1}{3} & 3\\3 & -4 & -6\end{pmatrix}$
   iv) $\xleftrightarrow{R_2\leftarrow R_2-3R_1} \begin{pmatrix}1 & \frac{1}{3} & 3\\0 & -5 & -15\end{pmatrix}$
   v) $\xleftrightarrow{R_2\leftarrow \frac{1}{5}R_2} \begin{pmatrix}1 & \frac{1}{3} & 3\\0 & 1 & 3\end{pmatrix}$
   vi) $\xleftrightarrow{R_1\leftarrow R_1-\frac{1}{3}R_2} \begin{pmatrix}1 & 0 & 2\\0 & 1 & 3\end{pmatrix}$
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 formed by the two lines with x-axis as base.
g) To find out intersection of

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

   with the x axis:
   i) equation of x axis is

$$y = 0$$

   ii) we have 2 equations:

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

$$y = 0$$

   iii) Augmented matrix for above is:

$$\begin{pmatrix}3 & -4 & -6\\0 & 1 & 0\end{pmatrix} \tag{1.1.4}$$

   iv) This can be reduced as follows:
      A) $\begin{pmatrix}3 & -4 & -6\\0 & 1 & 0\end{pmatrix}$
      B) $\xleftrightarrow{R_1\leftarrow \frac{1}{3}R_1} \begin{pmatrix}1 & \frac{1}{3} & 3\\0 & 1 & 0\end{pmatrix}$
      C) $\xleftrightarrow{R_1\leftarrow R_1+\frac{4}{3}R_2} \begin{pmatrix}1 & 0 & -2\\0 & 1 & 0\end{pmatrix}$
   v) Thus,

$$x = -2, y = 0 \tag{1.1.5}$$

   is the solution for the two equations.

vi) Let this point be Q

$$\therefore Q = \begin{pmatrix} -2 \\ 0 \end{pmatrix} \tag{1.1.6}$$

is the point of intersection of the line

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

with the x axis

h) To find out intersection of

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

with the x axis:

i) equation of x axis is

$$y = 0$$

ii) we have 2 equations:

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

$$y = 0$$

iii) Augmented matrix for above is:

$$\begin{pmatrix} 3 & 1 & 9 \\ 0 & 1 & 0 \end{pmatrix} \tag{1.1.7}$$

iv) This can be reduced as follows:

A) $\begin{pmatrix} 3 & 1 & 9 \\ 0 & 1 & 0 \end{pmatrix}$

B) $\xleftrightarrow{R_1 \leftarrow \frac{1}{3}R_1} \begin{pmatrix} 1 & \frac{1}{3} & 3 \\ 0 & 1 & 0 \end{pmatrix}$

C) $\xleftrightarrow{R_1 \leftarrow R_1 - \frac{-1}{3}R_2} \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & 0 \end{pmatrix}$

v) Thus,

$$x = 3, y = 0 \tag{1.1.8}$$

is the solution for the two equations.

vi) Let this point be R

$$\therefore R = \begin{pmatrix} 3 \\ 0 \end{pmatrix} \tag{1.1.9}$$

is the point of intersection of the line

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

with the x axis

i) i) P=$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, Q=$\begin{pmatrix} -2 \\ 0 \end{pmatrix}$ and R=$\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ 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.

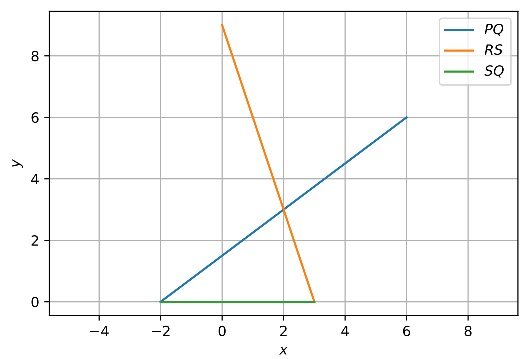
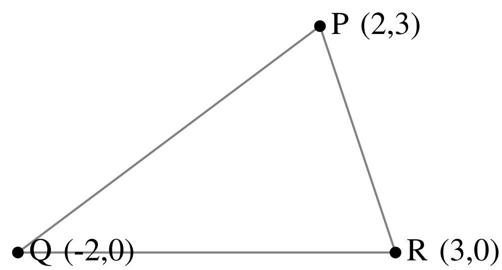


Fig. 1.1. Two lines representing given equations meet at point $\begin{pmatrix} 2 & 3 \end{pmatrix}$
.

j)

k) 

Tikz-Diagram