

Linear Equations in Two Variables

- **Linear Equation in two Variables:** Equation of the form: $ax + by + c = 0$
Here, a , b and c are real numbers, where a and b are not both zero.
Example: $2x + 3y - 9 = 0$ is a linear equation of two variables because 2, 3 & -9 are all real numbers and also both $a, b \neq 0$.
- There are infinitely many solutions for a linear equation of two variables.
- The graph of every linear equation in two variables is a straight line.

Solution of an Equation in Two Variables

Example:

Given the equation $2x + 3y = 18$, determine if the ordered pair $(3, 4)$ is a solution to the equation.

We substitute 3 in for x and 4 in for y .

$$2(3) + 3(4) ? 18$$

$$6 + 12 ? 18$$

$$18 = 18 \text{ True.}$$

Therefore, the ordered pair $(3, 4)$ is a solution to the equation $2x + 3y = 18$.

Exercise 8A

Question 1:

(i) The given equation is $x = 5$

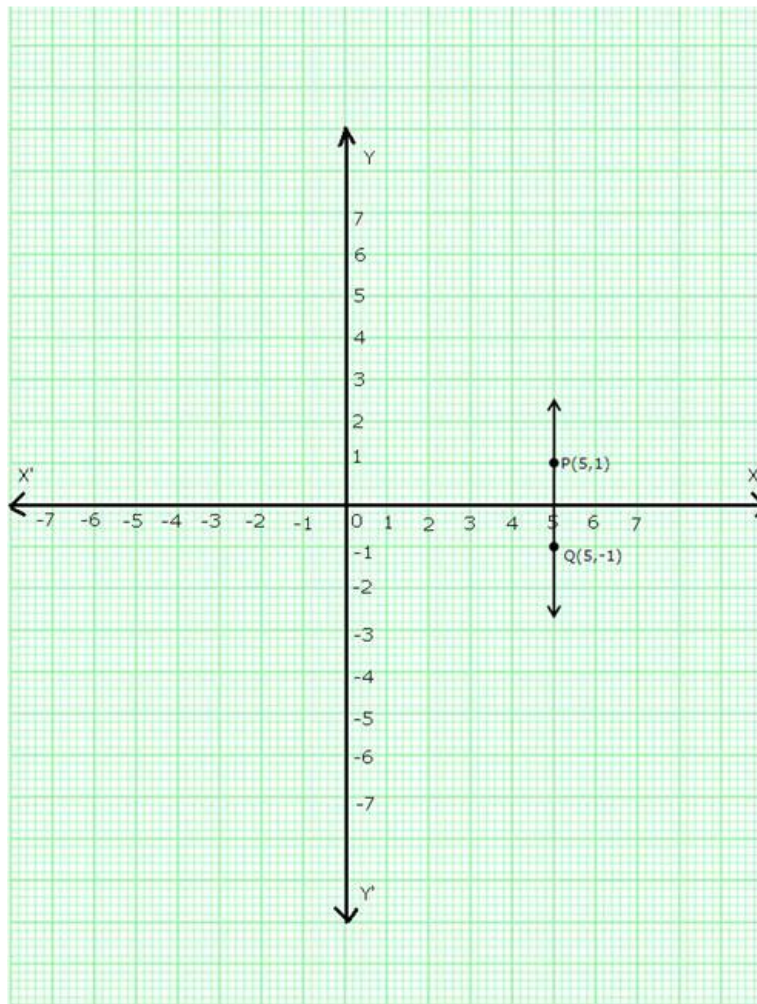
Take two solutions of the given equation as $x = 5, y = 1$ and $x = 5, y = -1$

Thus we get the following table:

x	5	5
y	1	-1

Plot points $P(5,1)$ and $Q(5,-1)$ on the graph paper.

Join PQ . The line PQ is the required graph.



(ii) The given equation is $y = -2$

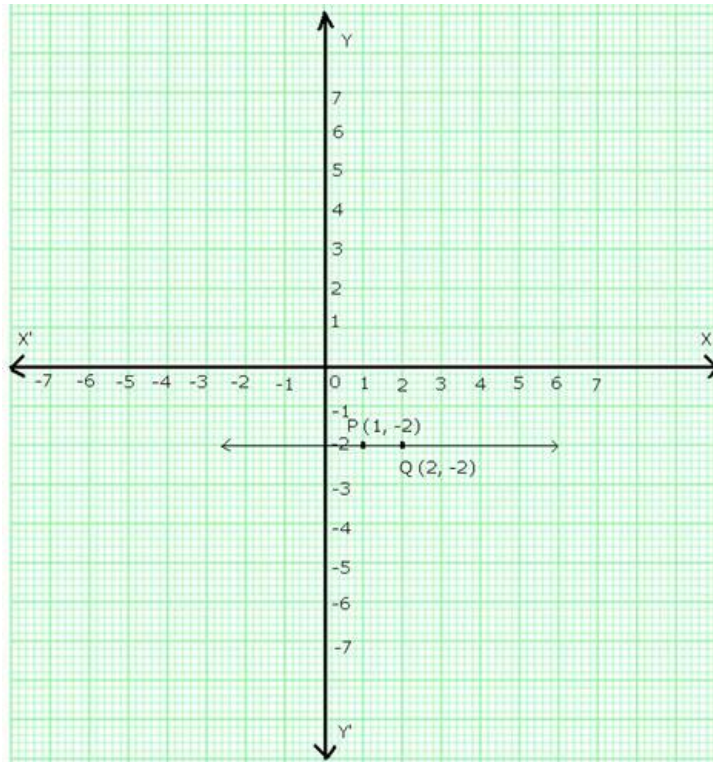
Take two solutions of the given equation as $x = 1, y = -2$ and $x = 2, y = -2$.

Thus we have the following table:

x	1	2
y	-2	-2

Plot points P(1,-2) and Q(2,-2) on the graph paper. Join PQ. The line PQ is the required

graph.



(iii) The given equation is

$$x + 6 = 0$$

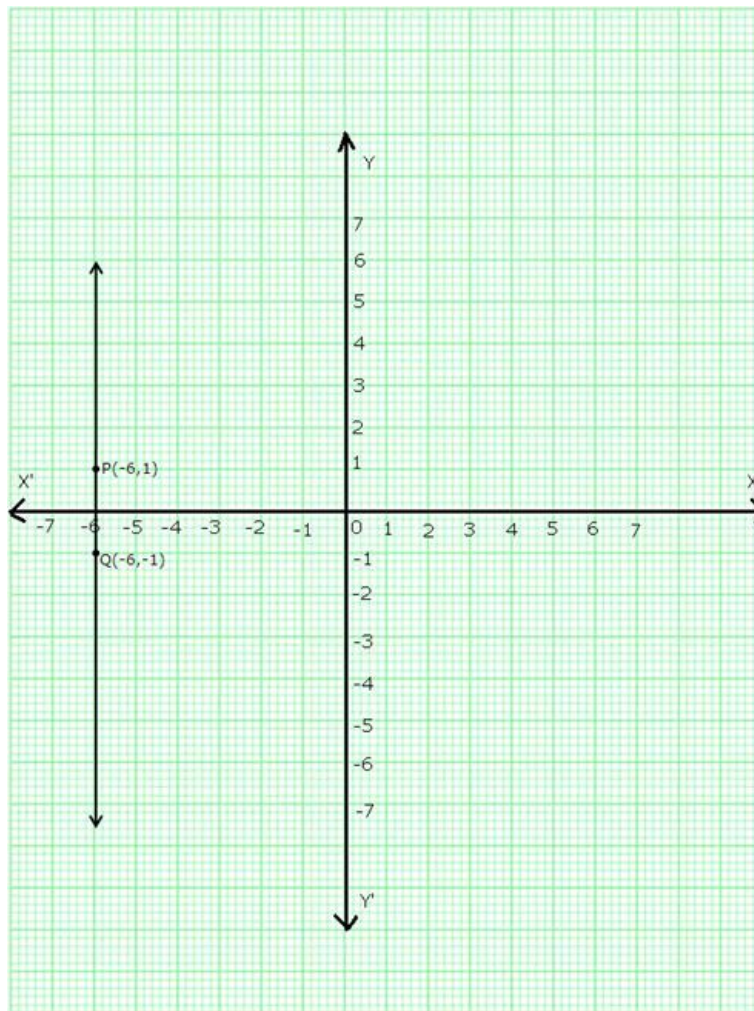
$$\Rightarrow x = -6$$

Let $x = -6$ & $y = 1$

$x = -6$ & $y = -1$

x	-6	-6
y	1	-1

Plot points P(-6,1) and Q(-6,-1) on the graph paper. Join PQ. The line PQ is the required graph.



(iv) The given equation is

$$x + 7 = 0$$

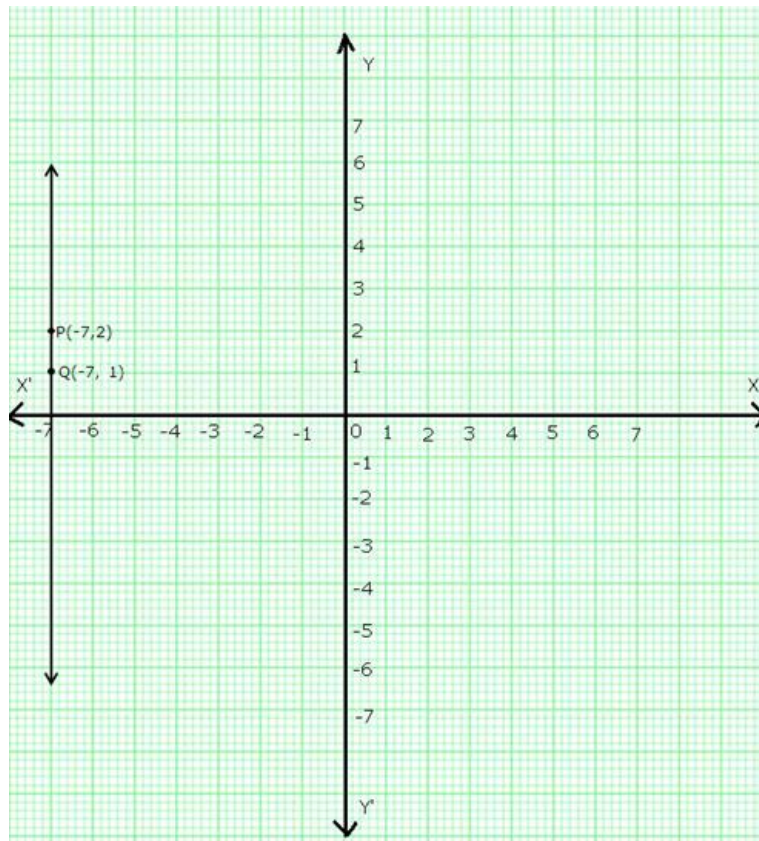
$$\Rightarrow x = -7$$

Let $x = -7, y = 2$ and $x = -7, y = 1$

Thus we have the following table:

x	-7	-7
y	2	1

Plot points $P(-7, 2)$ and $Q(-7, 1)$ on the graph paper. Join PQ. The line PQ is the required graph.



(v) $y = 0$ represents the x-axis

(vi) $x = 0$ represents the y-axis.

Question 2:

The given equation is $y = 3x$.

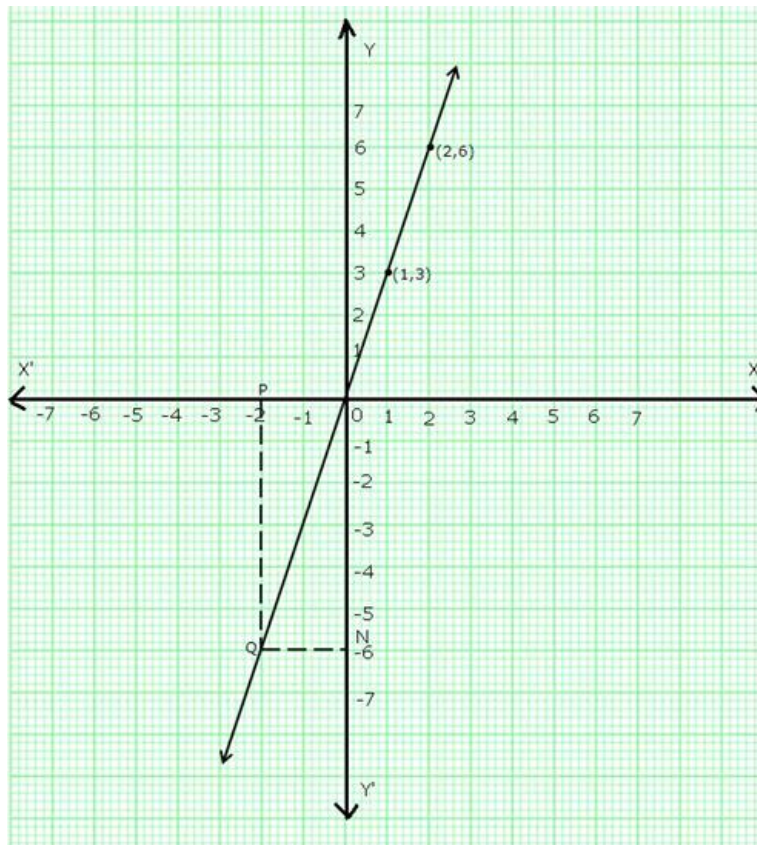
Putting $x = 1$, $y = 3(1) = 3$

Putting $x = 2$, $y = 3(2) = 6$

Thus, we have the following table:

x	1	2
y	3	6

Plot points (1,3) and (2,6) on a graph paper and join them to get the required graph.



Take a point P on the left of y-axis such that the distance of point P from the y-axis is 2 units.

Draw PQ parallel to y-axis cutting the line $y = 3x$ at Q. Draw QN parallel to x-axis meeting y-axis at N.

So, $y = ON = -6$.

Question 3:

The given equation is,

$$x + 2y - 3 = 0$$

$$\Rightarrow x = 3 - 2y$$

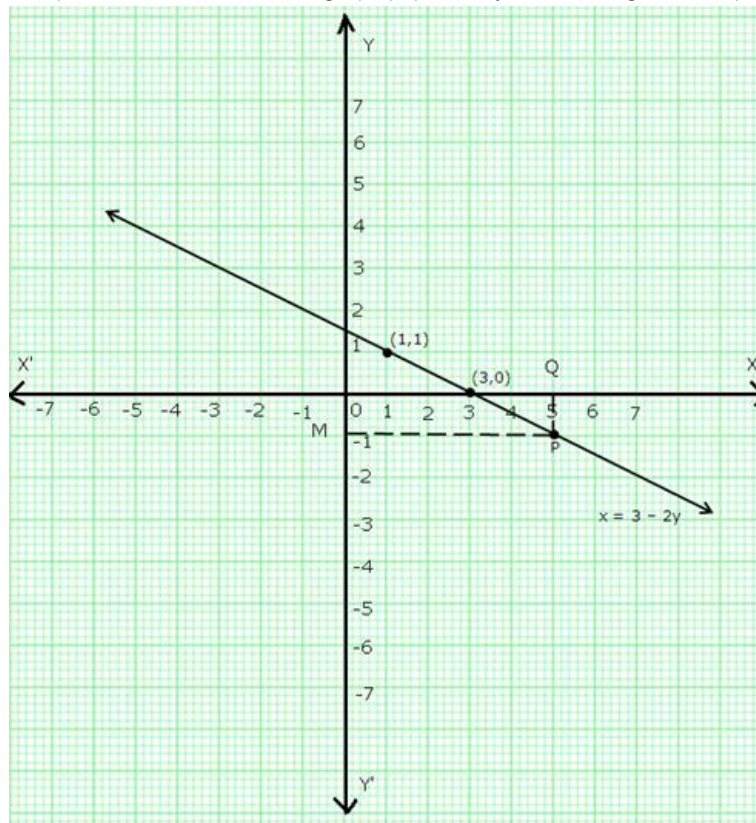
$$\text{Putting } y = 1, x = 3 - (2 \times 1) = 1$$

$$\text{Putting } y = 0, x = 3 - (2 \times 0) = 3$$

Thus, we have the following table:

x	1	3
y	1	0

Plot points (1,1) and (3,0) on a graph paper and join them to get the required graph.



Take a point Q on x-axis such that OQ = 5.

Draw QP parallel to y-axis meeting the line ($x = 3 - 2y$) at P.

Through P, draw PM parallel to x-axis cutting y-axis at M.

So, $y = OM = -1$.

Question 4:

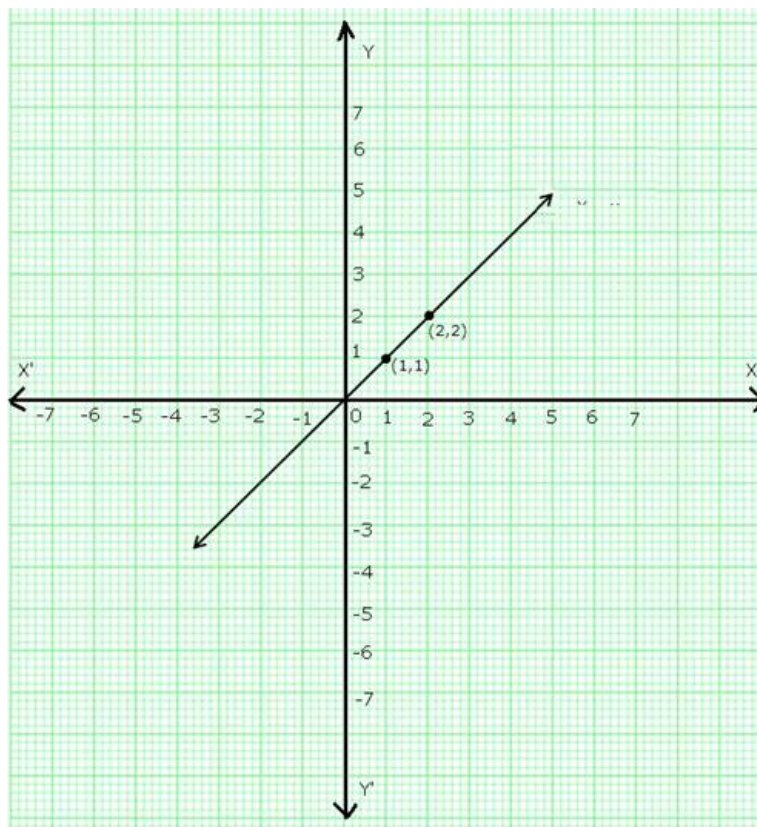
(i) The given equation is $y = x$

Let $x = 1$, then $y = 1$ and let $x = 2$, then $y = 2$

Thus, we have the following table:

x	1	2
y	1	2

Plot points (1,1) and (2,2) on a graph paper and join them to get the required graph.



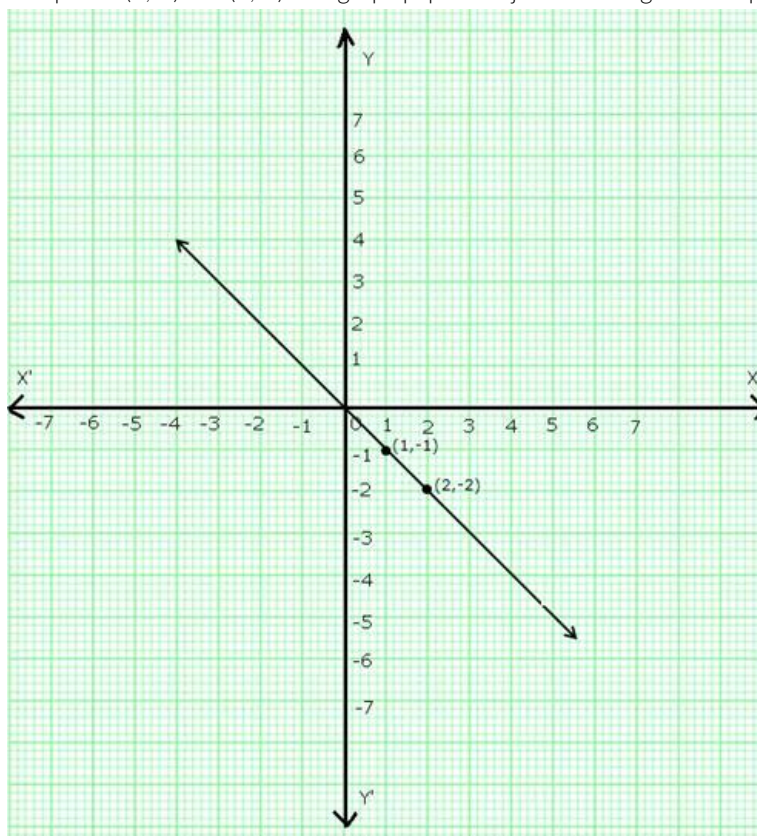
(ii) The given equation is $y = -x$

Now, if $x = 1$, $y = -1$ and if $x = 2$, $y = -2$

Thus, we have the following table:

x	1	2
y	-1	-2

Plot points (1,-1) and (2,-2) on a graph paper and join them to get the required graph.



(iii) The given equation is $y + 3x = 0$

$$\Rightarrow y = -3x$$

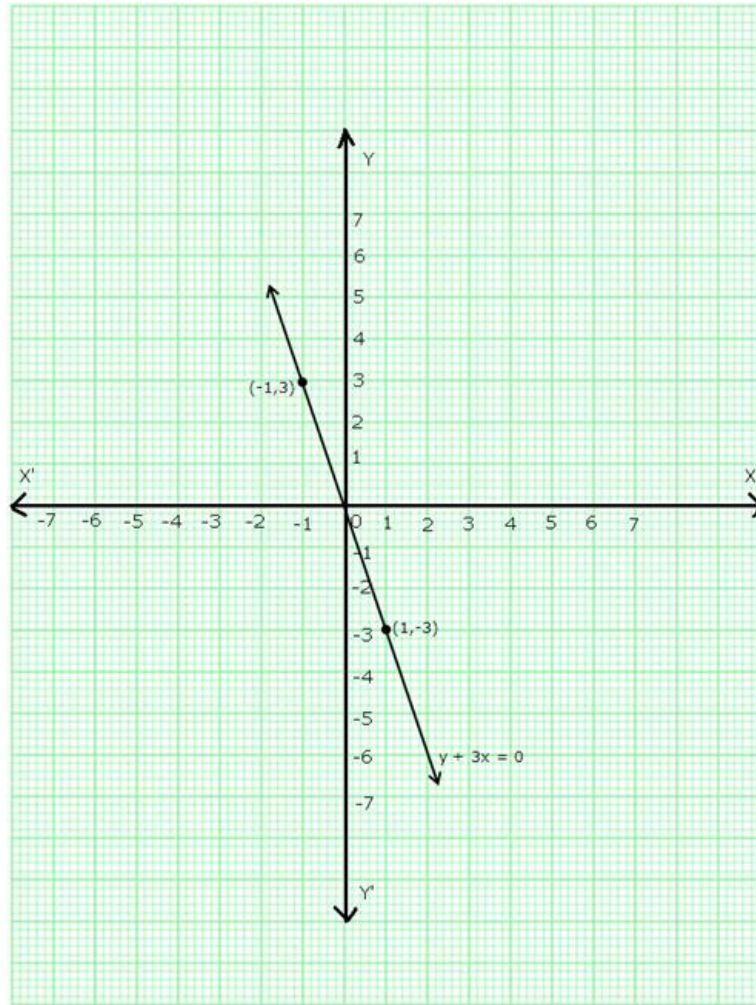
Now, if $x = -1$, then $y = -3(-1) = 3$

And, if $x = 1$, then $y = -3(1) = -3$

Thus we have the following table:

x	1	-1
y	-3	3

Plot points $(1, -3)$ and $(-1, 3)$ on a graph paper and join them to get the required graph.



(iv) The given equation is $2x + 3y = 0$

$$\Rightarrow y = \frac{-2}{3}x$$

Now, if $x = 3$, then

$$y = \frac{-2}{3} \times 3 = -2$$

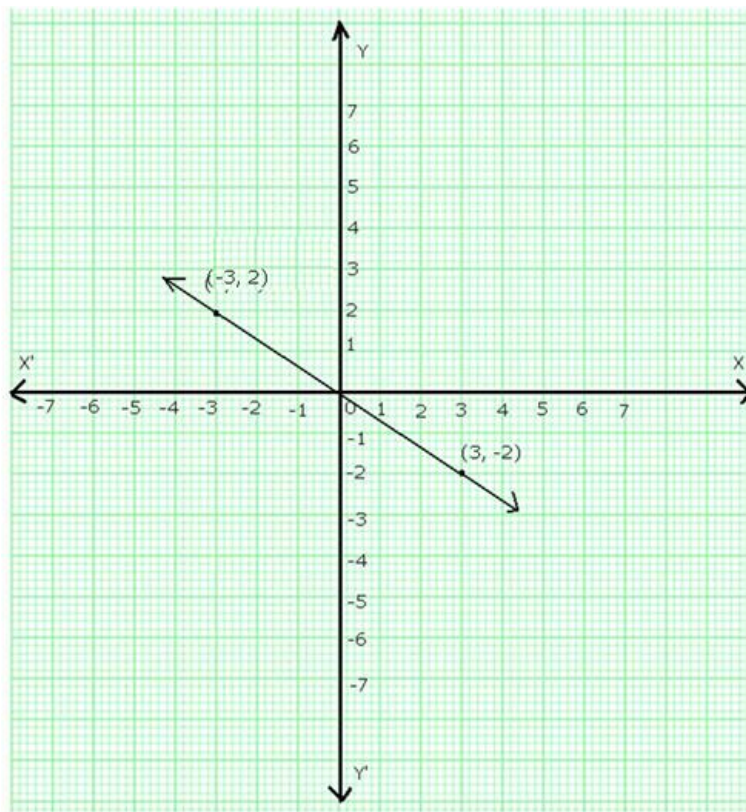
And, if $x = -3$, then

$$y = \frac{-2}{3} \times (-3) = 2$$

Thus, we have the following table

x	3	-3
y	-2	2

Plot points $(3, -2)$ and $(-3, 2)$ on a graph paper and join them to get the required graph.



(v) The given equation is $3x - 2y = 0$

$$\Rightarrow y = \frac{3}{2}x$$

Now, if $x = 2$,

$$y = \frac{3}{2} \times 2 = 3$$

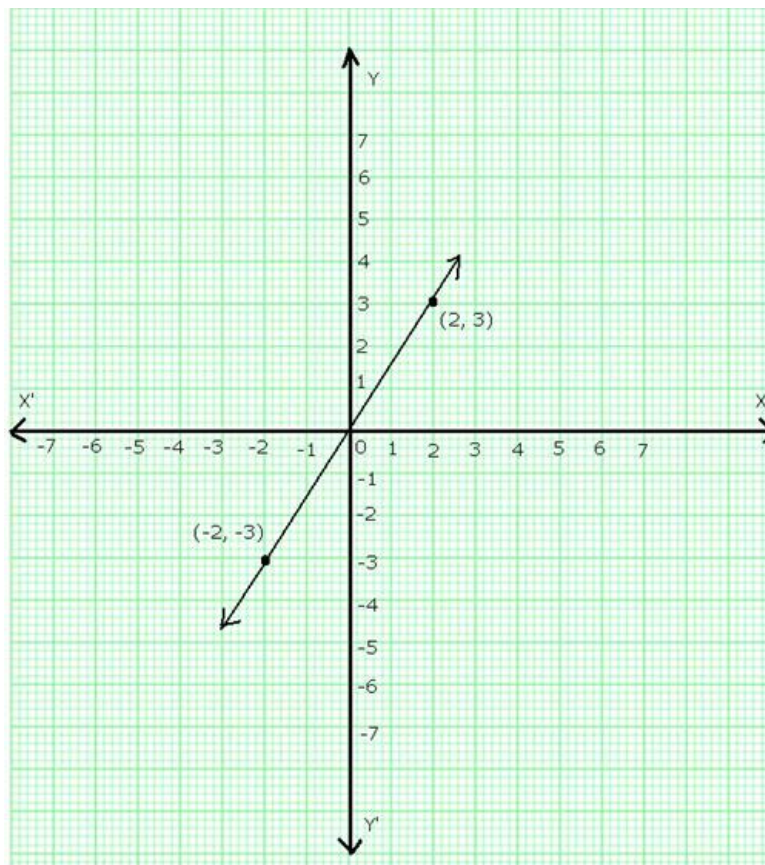
And, if $x = -2$,

$$y = \frac{3}{2} \times (-2) = -3$$

Thus, we have the following table:

x	2	-2
y	3	-3

Plot points (2,3) and (-2,-3) on a graph paper and join them to get the required graph.



(vi) The given equation is $2x + y = 0$

$$\Rightarrow y = -2x$$

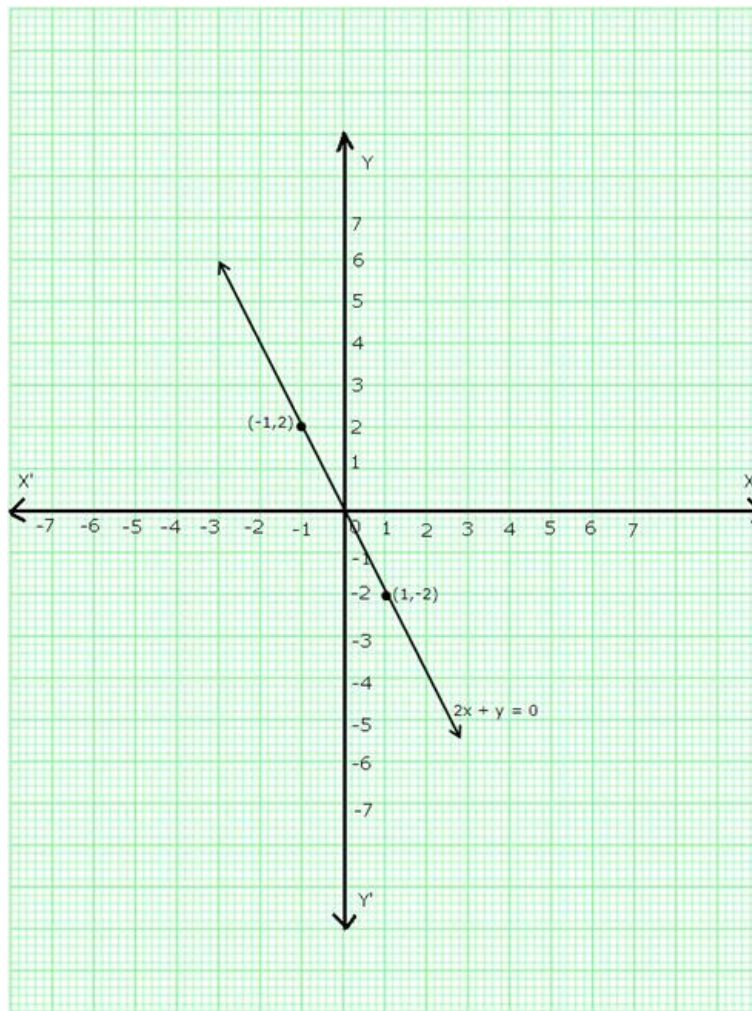
Now, if $x = 1$, then $y = -2 \cdot 1 = -2$

And, if $x = -1$, then $y = -2 \cdot (-1) = 2$

Thus, we have the following table:

x	1	-1
y	-2	2

Plot points $(1, -2)$ and $(-1, 2)$ on a graph paper and join them to get the required graph.



Question 5:

The given equation is, $2x - 3y = 5$

$$\Rightarrow y = \frac{2x-5}{3}$$

Now, if $x = 4$, then

$$y = \frac{2(4)-5}{3} = \frac{8-5}{3} = 1$$

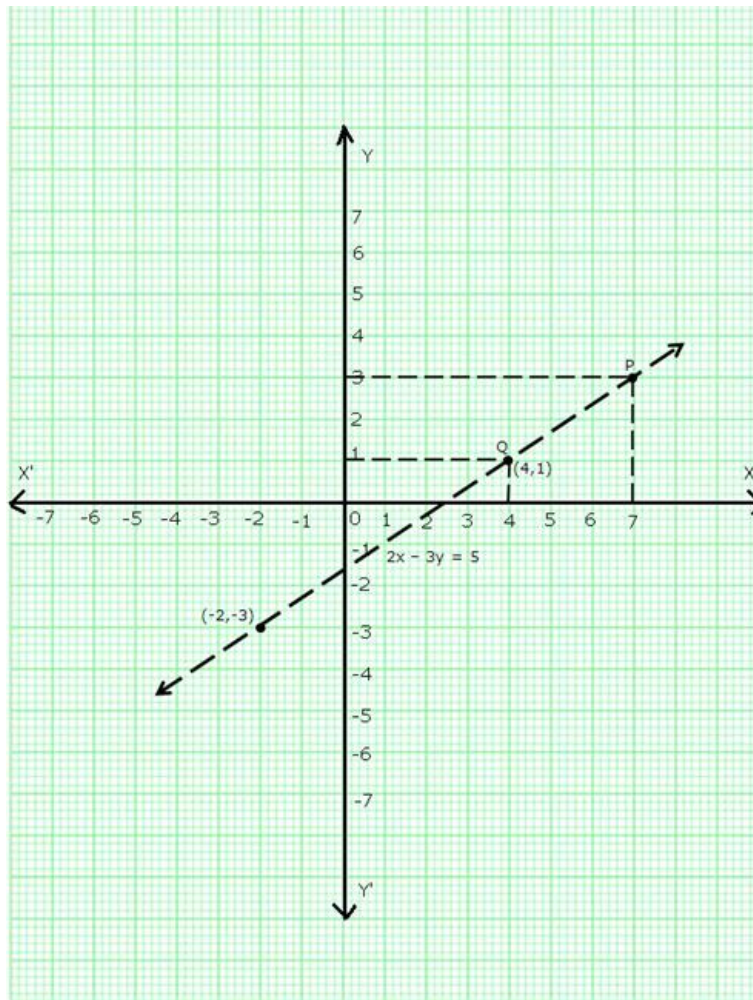
And, if $x = -2$, then

$$y = \frac{2(-2)-5}{3} = \frac{-4-5}{3} = \frac{-9}{3} = -3$$

Thus, we have the following table:

x	4	-2
y	1	-3

Plot points (4,1) and (-2,-3) on a graph paper and join them to get the required graph.



(i) When $x = 4$, draw a line parallel to y -axis at a distance of 4 units from y -axis to its right cutting the line at Q and through Q draw a line parallel to x -axis cutting y -axis which is found to be at a distance of 1 units above x -axis.

Thus, $y = 1$ when $x = 4$.

(ii) When $y = 3$, draw a line parallel to x -axis at a distance of 3 units from x -axis and above it, cutting the line at point P . Through P , draw a line parallel to y -axis meeting x -axis at a point which is found to be 7 units to the right of y axis.

Thus, when $y = 3$, $x = 7$.

Question 6:

The given equation is $2x + y = 6$

$$\Rightarrow y = 6 - 2x$$

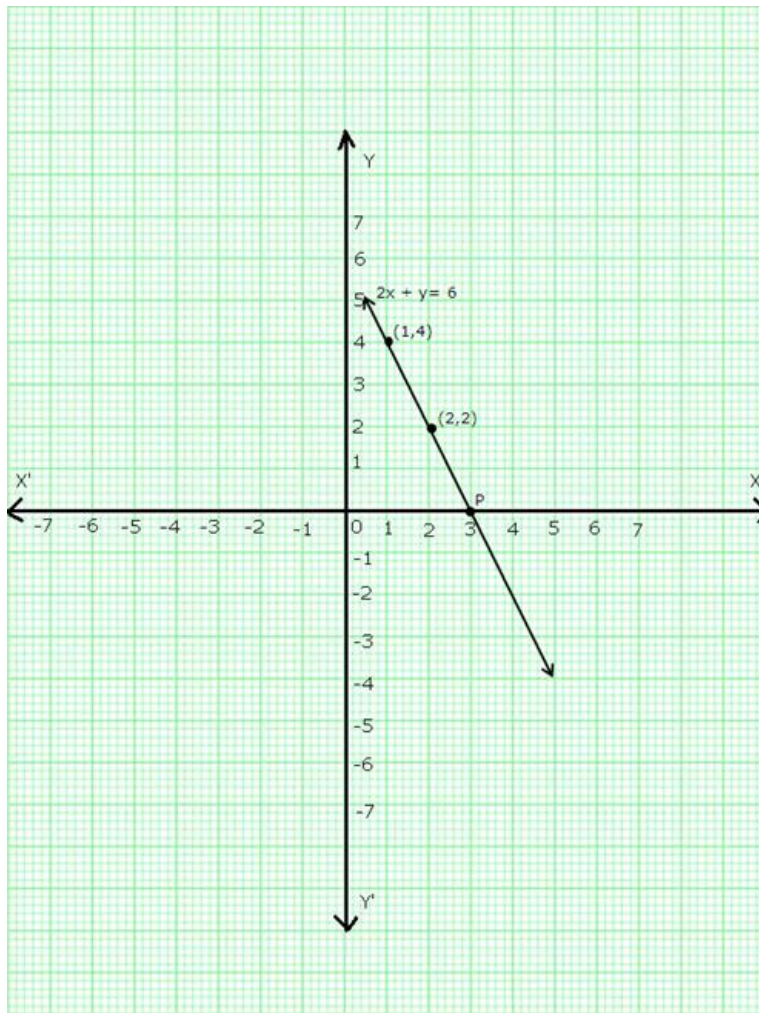
Now, if $x = 1$, then $y = 6 - 2(1) = 4$

And, if $x = 2$, then $y = 6 - 2(2) = 2$

Thus, we have the following table:

x	1	2
y	4	2

Plot points $(1, 4)$ and $(2, 2)$ on a graph paper and join them to get the required graph.



We find that the line cuts the x-axis at a point P which is at a distance of 3 units to the right of y-axis.

So, the co-ordinates of P are (3,0).

Question 7:

The given equation is $3x + 2y = 6$

$$\Rightarrow 2y = 6 - 3x$$

$$\Rightarrow y = \frac{6-3x}{2}$$

Now, if $x = 2$, then

$$y = \frac{6-3(2)}{2} = 0$$

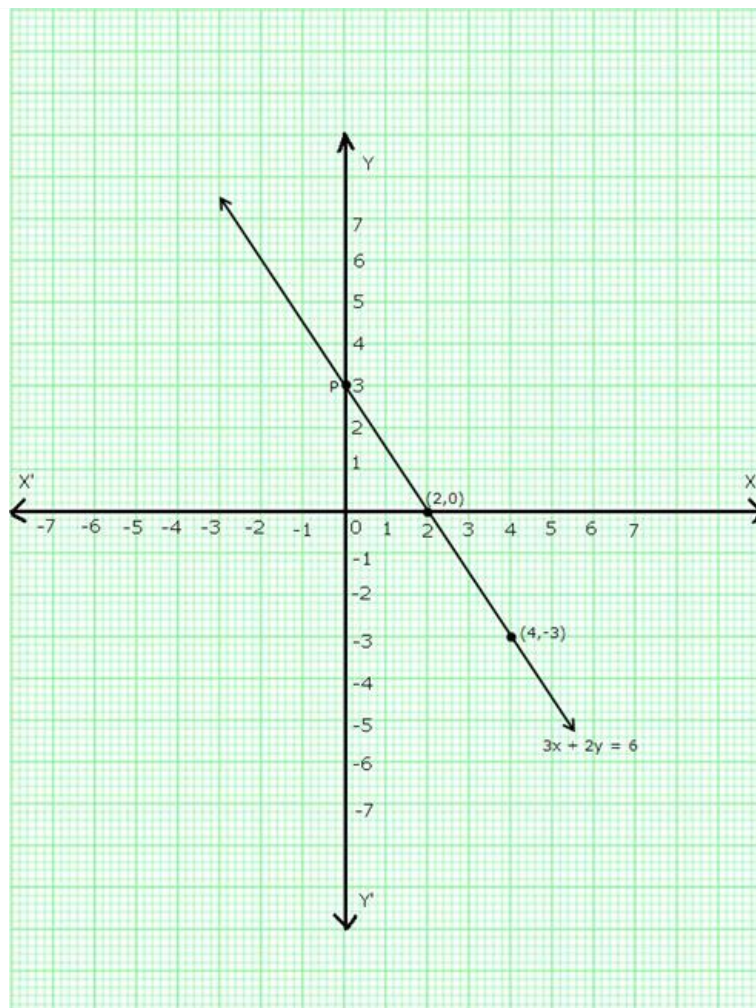
And, if $x = 4$, then

$$y = \frac{6-3(4)}{2} = \frac{-6}{2} = -3$$

Thus, we have the following table:

x	2	4
y	0	-3

Plot points (2, 0) and (4, -3) on a graph paper and join them to get the required graph.



We find that the line $3x + 2y = 6$ cuts the y-axis at a point P which is 3 units above the x-axis.

So, co-ordinates of P are (0,3).