
Exercise – 13.1

1. Express the following linear equations in the form $ax + by + c = 0$ and indicate the values of a , b and c in each case:

(i) $-2x + 3y = 12$

(v) $2x + 3 = 0$

(ii) $x - \frac{y}{2} - 5 = 0$

(vi) $y - 5 = 0$

(iii) $2x + 3y = 9 \cdot 3\bar{5}$

(vii) $4 = 3x$

(iv) $3x = -7y$

(viii) $y = \frac{x}{2}$

Sol:

- (i) We have

$$-2x + 3y = 12$$

$$\Rightarrow -2x + 3y - 12 = 0$$

On comparing this equation with $ax + by + c = 0$ we obtain $a = -2, b = 3$ and $c = -12$.

- (ii) Given that

$$x - \frac{y}{2} - 5 = 0$$

$$1x - \frac{y}{2} - 5 = 0$$

On comparing this equation with $ax + by + c = 0$ we obtain $a = 1, b = \frac{-1}{2}$ and $c = -5$

- (iii) Given that

$$2x + 3y = 9 \cdot 3\bar{5}$$

$$\Rightarrow 2x + 3y - 9 \cdot 3\bar{5} = 0$$

On comparing this equation with $ax + by + c = 0$ we get $a = 2, b = 3$ and $c = -9 \cdot 3\bar{5}$

- (iv) $3x = -7y \Rightarrow 3x + 7y + 0 = 0$

On comparing this equation with $ax + by + c = 0$ we get $a = 3, b = 7$ and $c = 0$.

- (v) We have

$$2x + 3 = 0$$

$$2x + 0(y) + 3 = 0$$

On comparing this equation with $ax + by + c = 0$ we get $a = 2, b = 0$ and $c = 3$

- (vi) Given that

$$y - 5 = 0$$

$$\Rightarrow 0x + 1y - 5 = 0$$

On comparing this equation with $ax + by + c = 0$ we get $a = 0, b = 1$ and $c = -5$

(vii) We have

$$4 = x$$

$$-3x + 0 \cdot y + 4 = 0$$

On comparing the equation with $ax + by + c = 0$ we get $a = -3, b = 0$ and $c = 4$

(viii) Given that,

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

$$\Rightarrow 2y = x$$

$$\Rightarrow x - 2y + 0 = 0$$

On comparing this equation with $ax + by + c = 0$ we get $a = 1, b = -2$ and $c = 0$

2. Write each of the following as an equation in two variables:

(i) $2x = -3$

(ii) $y = 3$

(iii) $5x = \frac{7}{2}$

(iv) $y = \frac{3}{2}x$

Sol:

(i) We have

$$2x = -3$$

$$\Rightarrow 2x + 3 = 0$$

$$\Rightarrow 2x + 0 \cdot y + 3 = 0$$

(ii) We have,

$$y = 3$$

$$y - 3 = 0$$

$$\Rightarrow 0 \cdot x + 1 \cdot y - 3 = 0$$

(iii) Given

$$5x = \frac{7}{2}$$

$$10x - 7 = 0$$

$$10x + 0 \cdot y - 7 = 0$$

(iv) We have

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

$$3x - 2y = 0$$

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

3. The cost of ball pen is Rs. 5 less than half of the cost of fountain pen. Write this statement as a linear equation in two variables.

Sol:

Let us assume the cost of the ball pen be Rs. x and that of a fountain pen to be y . then according to given statements

We have

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

$$\Rightarrow 2x = y - 10$$

$$\Rightarrow 2x - y + 10 = 0$$

Exercise – 13.2

1. Write two solutions for each of the following equations:

(i) $3x + 4y = 7$

(ii) $x = 6y$

(iii) $x + \pi y = 4$

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

Sol:

- (i) Given that $3x + 4y = 7$

Substituting $x = 0$ in this equation, we get

$$3 \times 0 + 4y = 7$$

$$\Rightarrow y = \frac{7}{4}$$

So, $\left(0, \frac{7}{4}\right)$ is a solution of the given equation substituting $x = 1$, in given equation, we

get

$$\Rightarrow 3 \times 1 + 4y = 7$$

$$\Rightarrow 4y = 7 - 3$$

$$\Rightarrow = 4$$

$$\Rightarrow y = 1$$

So, $(1, 1)$ is a solution of the given equation

$\therefore \left(0, \frac{7}{4}\right)$ and $(1, 1)$ are the solutions for the given equation.

- (ii) We have

$$x = 6y$$

Substituting $y = 0$ in this equation, we get $x = 6 \times 0 = 0$

So, $(0,0)$ is a function of the given equation substituting $y = 1$, in the given equation, we set $x = 6 \times 1 = 6$

So, $(6,1)$ is a solution of the given equation.

$\therefore$ we obtain $(0,0)$ and $(6,1)$ as solutions of the given equation.

(iii) We have

$$x + \pi y = 4$$

Substituting $y = 0$ in this equation, we get

$$x + \pi(0) = 4$$

$$\Rightarrow x = 4$$

So, $(y,0)$ is a solution of the give equation.

$\therefore$ we obtain $(4,0)$ and $(4-x)$ as solutions of the given equation.

(iv) Given that

$$\frac{2}{3}x - y = 4$$

Substituting $y = 0$ in this equation we get

$$\frac{2}{3}x - 0 = 4$$

$$\Rightarrow x = 4 \times \frac{3}{2}$$

$$\Rightarrow x = 6$$

So, $(6,0)$ is a solution of the given equation

Substituting $y = 1$ in the given equation, we get

$$\frac{2}{3}x - 1 = 4$$

$$\frac{2}{3}x = 5 \Rightarrow x = \frac{15}{2}$$

So, $\left(\frac{15}{2}, 1\right)$ is a solution of the given equation.

$\therefore$ We obtain $(6,0)$ and $\left(\frac{15}{2}, 1\right)$ as solutions of the given equation.

2. Write two solutions of the form $x = 0$, $y = a$ and $x = b$, $y = 0$ for each of the following equations:

(i) $5x - 2y = 10$

(ii) $-4x + 3y = 12$

(iii) $2x + 3y = 24$

Sol:

(i) Given that

$$5x - 2y = 10$$

Substituting $x = 0$ in the equation $5x - 2y = 10$

$$\text{We get } 5 \times 0 - 2y = 10$$

$$\Rightarrow y = \frac{-10}{2} = -5$$

Thus $x = 0$ and $y = -5$ is a solution of $5x - 2y = 10$

Substituting $y = 0$, we get

$$\Rightarrow 5x - 2 \times 0 = 10$$

$$\Rightarrow 5x = 10$$

$$\Rightarrow x = 2$$

Thus, $x = 2$ and $y = 0$ is a solution of $5x - 2y = 10$

Thus $x = 0, y = -5$ and $x = 2, y = 0$ are two solutions of $5x - 2y = 10$

(ii) Given that,

$$-4x + 3y = 12$$

Substituting $x = 0$ in the equation

$$-4x + 3y = 12, \text{ we get}$$

$$\Rightarrow -4 \times 0 + 3y = 12$$

$$\Rightarrow 3y = 12$$

$$\Rightarrow y = 4$$

Thus $x = 0$ and $y = 4$ is a solution of $-4x + 3y = 12$

Substituting $y = 0$ in the equation

$$-4x + 3y = 12, \text{ we get}$$

$$\Rightarrow -4x + 3 \times 0 = 12$$

$$\Rightarrow -4x = 12$$

$$\Rightarrow x = \frac{12}{-4} = -3$$

Thus, $x = -3$ and $y = 0$ is a solution of $-4x + 3y = 12$.

Thus $x = 0, y = 4$ and $x = -3, y = 0$ are two solutions of $-4x + 3y = 12$

(iii) Given that

$$2x + 3y = 24$$

Substituting $x = 0$ in the given equation

$$2x + 3y = 24, \text{ We get}$$

$$\Rightarrow 2 \times 0 + 3y = 24$$

$$\Rightarrow 3y = 24$$

$$\Rightarrow y = \frac{24}{3} = 8$$

Thus, $x = 0$ and $y = 8$ is a solution of $2x + 3y = 24$

Substituting $y = 0$ in $2x + 3y = 24$, we get $2x + 3 \times 0 = 24$

$$\Rightarrow 2x = 24$$

$$\Rightarrow x = \frac{24}{2} = 12$$

Thus $x = 12$ and $y = 0$ is a solution of $2x + 3y = 24$

Thus $x = 0, y = -8$ and $x = 12, y = 0$ are two solutions of $2x + 3y = 24$

3. Check which of the following are solutions of the equation $2x - y = 6$ and which are not:

- (i) $(3, 0)$ (ii) $(0, 6)$ (iii) $(2, -2)$ (iv) $(\sqrt{3}, 0)$ (v) $(\frac{1}{2}, -5)$

Sol:

In the equation $2x - y = 6$ we get

$$LHS = 2x - y \text{ and } RHS = 6$$

(i) Substituting $x = 3$ and $y = 0$ in $2x - y = 6$, we get

$$LHS = 2 \times 3 - 0 = 6 - 0 = 6 = RHS$$

So, $x = 3, y = 0$ or $(3, 0)$ is a solution of $2x - y = 6$

(ii) Substituting $x = 0$ and $y = 6$ in $2x - y = 6$, we get

$$LHS = 2 \times 0 - 6 = -6 \neq RHS$$

So, $(0, 6)$ is not a solution of the equation $2x - y = 6$

(iii) Substituting $x = 2, y = -2$ in $2x - y = 6$, we get

$$LHS = 2 \times 2 - (-2) = 4 + 2 = 6 = RHS$$

So, $(2, -2)$ is a solution of $2x - y = 6$

(iv) Substituting $x = \sqrt{3}$ and $y = 0$ in $2x - y = 6$, we get

$$LHS = 2 \times \sqrt{3} - 0 = 2\sqrt{3} \neq RHS$$

So, $(\sqrt{3}, 0)$ is not a solution of the equation $2x - y = 6$

(v) Substituting $x = \frac{1}{2}$ and $y = -5$ in $2x - y = 6$, we get

$$LHS = 2 \times \frac{1}{2} - (-5) = 1 + 5 = 6 = RHS$$

So, $(\frac{1}{2}, -5)$ is a solution of the $2x - y = 6$

4. If $x = -1$, $y = 2$ is a solution of the equation $3x + 4y = k$, find the value of k .

Sol:

Given that

$$3x + 4y = k$$

It is given that $x = -1$ and $y = 2$ is a solution of the equation $3x + 4y = k$

$$\therefore 3 \times (-1) + 4 \times 2 = k$$

$$\Rightarrow -3 + 8 = k$$

$$\Rightarrow k = 5$$

$$\Rightarrow k = 5$$

5. Find the value of λ , if $x = -\lambda$ and $y = \frac{5}{2}$ is a solution of the equation $x + 4y - 7 = 0$.

Sol:

Given that

$$x + 4y - 7 = 0$$

It is given that $x = -\lambda$ and $y = \frac{5}{2}$ is a solution of the equation $x + 4y - 7 = 0$

$$\therefore -1 + 4 \times \frac{5}{2} - 7 = 0$$

$$\Rightarrow -\lambda + 10 - 7 = 0$$

$$\Rightarrow -\lambda = -3$$

$$\Rightarrow \lambda = 3$$

6. If $x = 2\alpha + 1$ and $y = \alpha - 1$ is a solution of the equation $2x - 3y + 5 = 0$, find the value of α .

Sol:

We have

$$2x - 3y + 5 = 0$$

It is given that $x = 2\alpha + 1$ and $y = \alpha - 1$ is a solution of the equation $2x - 3y + 5 = 0$

$$\therefore 2(2\alpha + 1) - 3(\alpha - 1) + 5 = 0$$

$$\Rightarrow 4\alpha + 2 - 3\alpha + 3 + 5 = 0$$

$$\Rightarrow \alpha + 10 = 0$$

$$\Rightarrow \alpha = -10$$

7. If $x = 1$ and $y = 6$ is a solution of the equation $8x - ay + a^2 = 0$, find the value of a .

Sol:

Given that

$$8x - ay + a^2 = 0$$

It is given that $x = 1$ and $y = 6$ is a solution on the equation $8x - ay + a^2 = 0$

$$\therefore 8 \times 1 - a \times 6 + a^2 = 0$$

$$\Rightarrow 8 - 6a + a^2 = 0$$

$$\Rightarrow a^2 - 6a + 8 = 0$$

$$\Rightarrow a^2 - 4a - 2a + 8 = 0$$

$$\Rightarrow a(a-4)(a-2) = 0$$

$$\Rightarrow a-4=0 \text{ or } a-2=0$$

$$a-4=0 \text{ or } a=2$$

Hence $a = 4$ or $a = 2$

Exercise – 13.3

1. Draw the graph of each of the following linear equations in two variables:

(i) $x + y = 4$

(ii) $x - y = 2$

(iii) $-x + y = 6$

(iv) $y = 2x$

(v) $3x + 5y = 15$

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

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

(viii) $2y = -x + 1$

Sol:

(i) We have $x + y = 4$

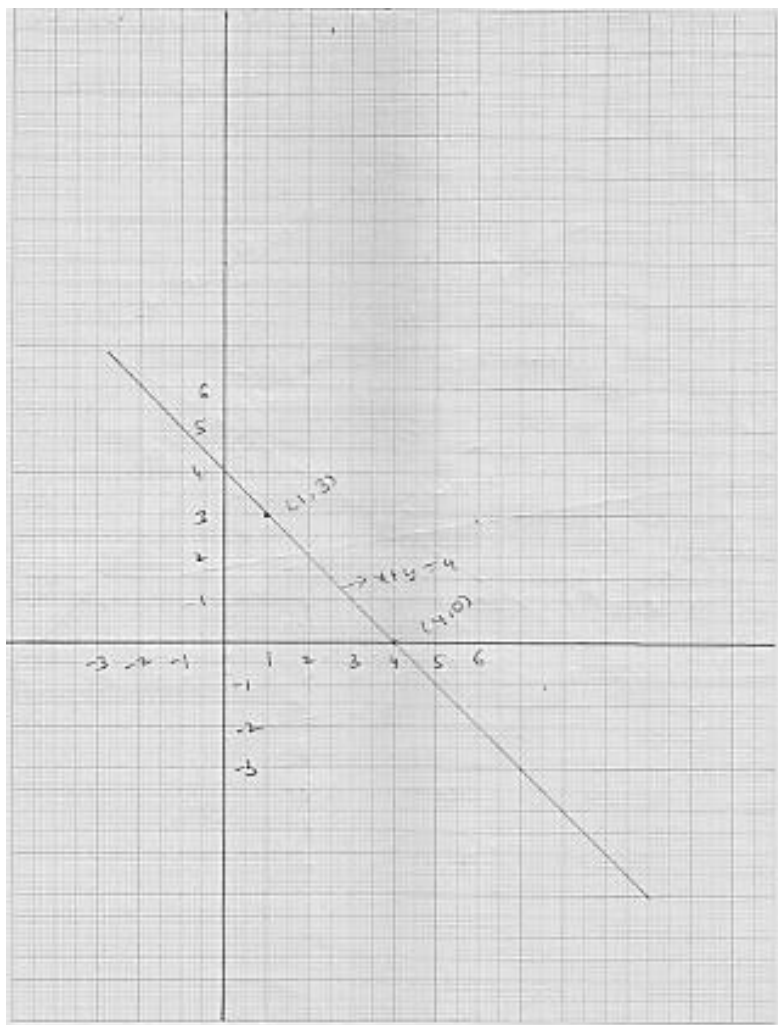
$$x = 4 - y$$

Putting $y = 0$, we get $x = 4 - 0 = 4$

Putting $y = 3$, we get $x = 4 - 3 = 1$

Thus, we get the following table giving the two points on the line represented by the equation $x + y = 4$

Graph for the equation $x + y = 4$



(ii) We have

$$x - y = 2$$

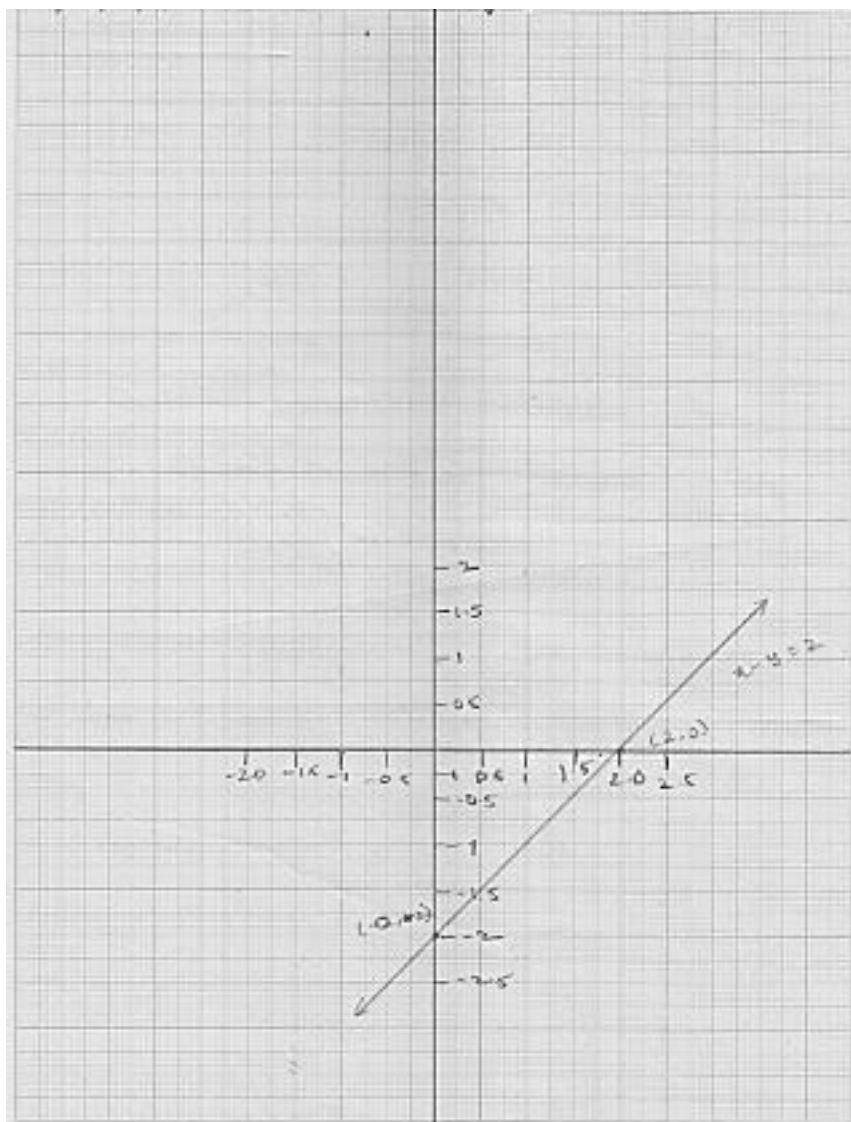
$$x = 2 + y \quad \dots\dots(i)$$

Putting $y = 0$, we get $x = 2 + 0 = 2$

Putting $y = -2$, we get $x = 2 - 2 = 0$

Thus, we get the following table giving the two points on the line represented by the equation $x - y = 2$

Graph for the equation $x - y = 2$



(iii) We have

$$-x + y = 6$$

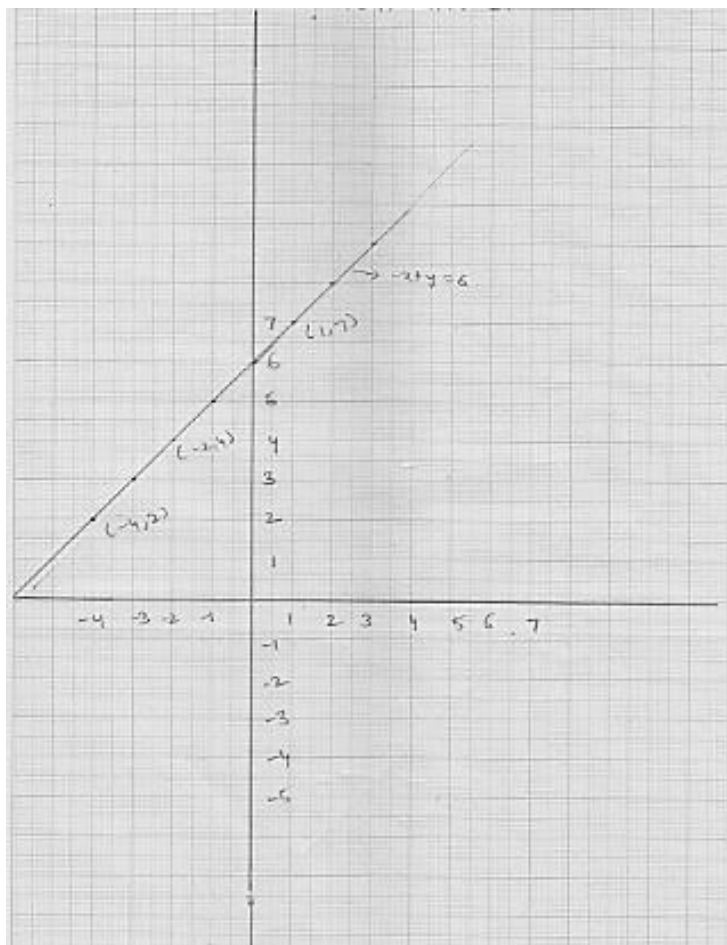
$$\Rightarrow x = 6 - y$$

Putting $y = -4$, we get $y = 6 - 4 = 2$

Putting $x = -3$ we get $y = 6 - 3 = 3$

Thus, we get the following table giving the two points on the line represented by the equation $-x + y = 6$

Graph for the equation $-x + y = 6$.



(iv) We have

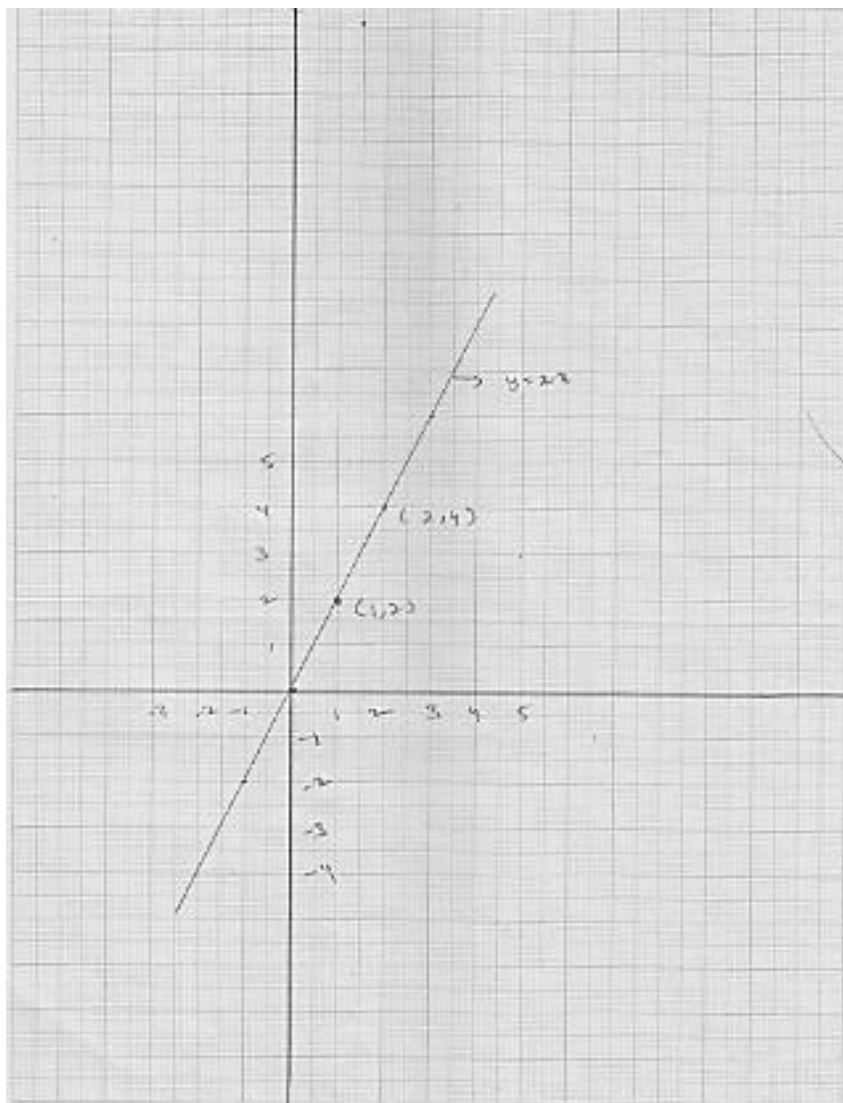
$$y = 2x \quad \dots\dots(i)$$

Putting $x = 0$, we get $y = 2 \times 0 = 0$

Putting $x = 1$ we get $y = 2 \times 1 = 2$

Thus, we get the following table giving the two points on the line represented by the equation $y = 2x$

Graph for the equation $y = 2x$



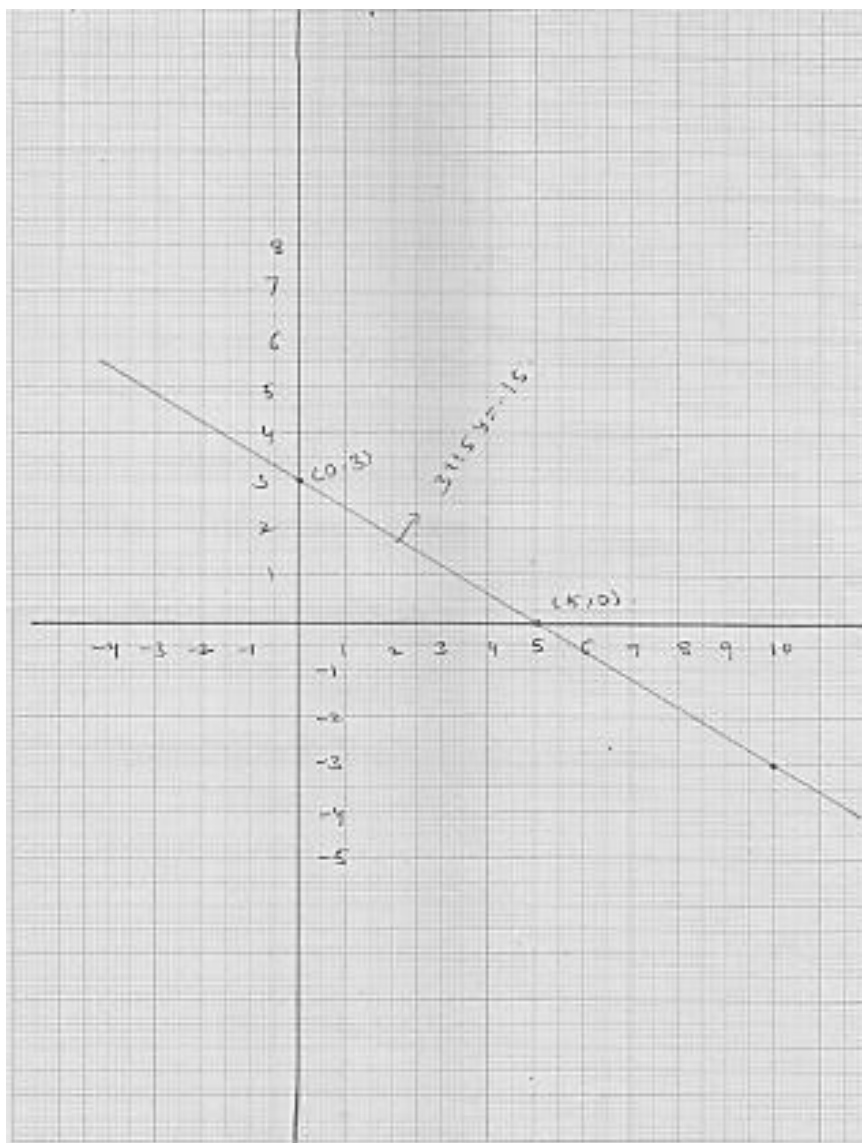
(v) We have
 $3x + 5y = 15$
 $3x = 15 - 5y$
 $x = \frac{15 - 5y}{3}$

Putting $y = 0$, we get $x = \frac{15 - 5 \times 0}{3} = 5$

Putting $y = 3$ we get $x = \frac{15 - 5 \times 3}{3} = 0$

Thus, we get the following table giving the two points on the line represented by the equation $3x + 5y - 15$

Graph for the equation $3x + 5y - 15$



(vi) We have

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

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

$$\Rightarrow 3x - 2y = 12$$

$$\Rightarrow 3x = 12 + 2y$$

$$\Rightarrow x + \frac{12 + 2y}{3}$$

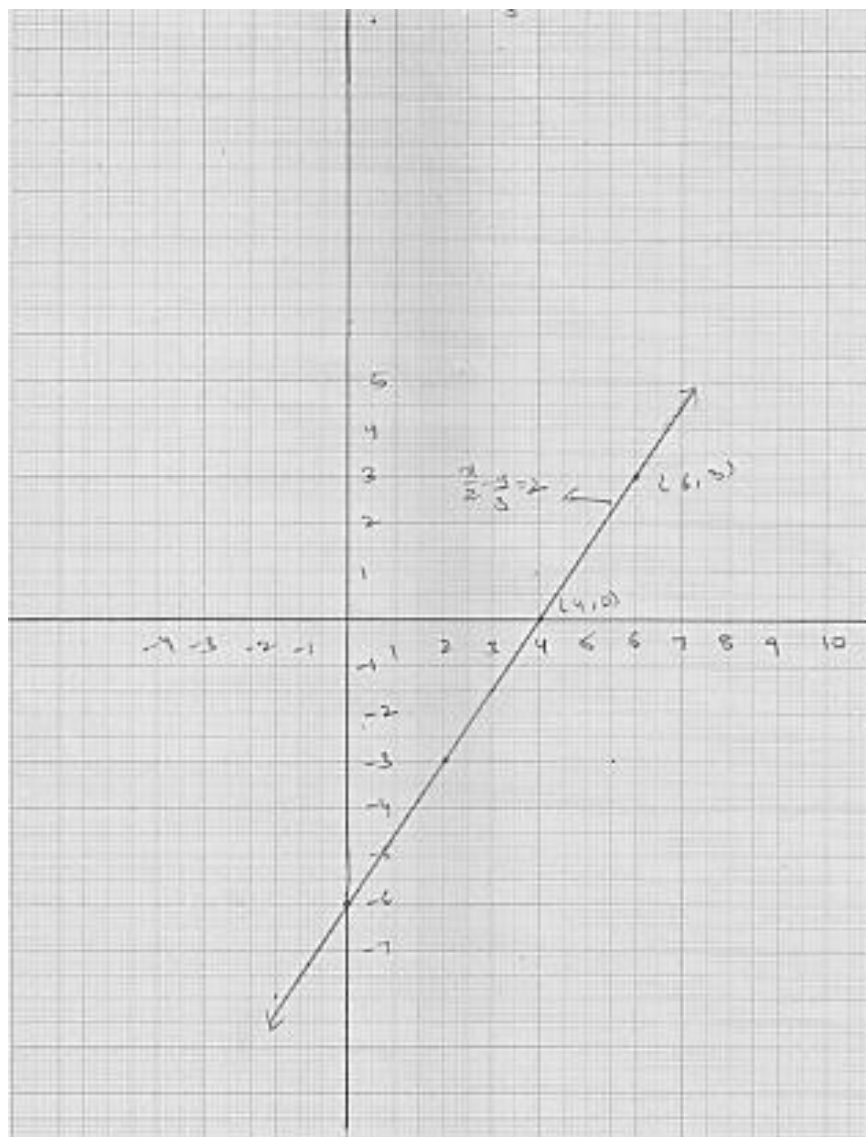
$$\text{Putting } y = -6, \text{ we get } x = \frac{12 + 2(-6)}{3} = 0$$

Putting $y = -3$, we get $x = \frac{12 + 2(-3)}{3} = 2$

Putting $y = 0$ we get $x = \frac{12 + 0}{3} = 4$

Thus, we get the following table giving the two points on the line represented by the equation $\frac{x}{2} - \frac{y}{3} = 2$

Graph for the equation $\frac{x}{2} - \frac{y}{3} = 2$



(vii) We have,

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

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

$$\Rightarrow x-2 = 3y-9$$

$$\Rightarrow x = 3y-9+2$$

$$\Rightarrow x = 3y-7$$

Putting $y = 0$, we get $x-0 = -7 \Rightarrow x = -7$

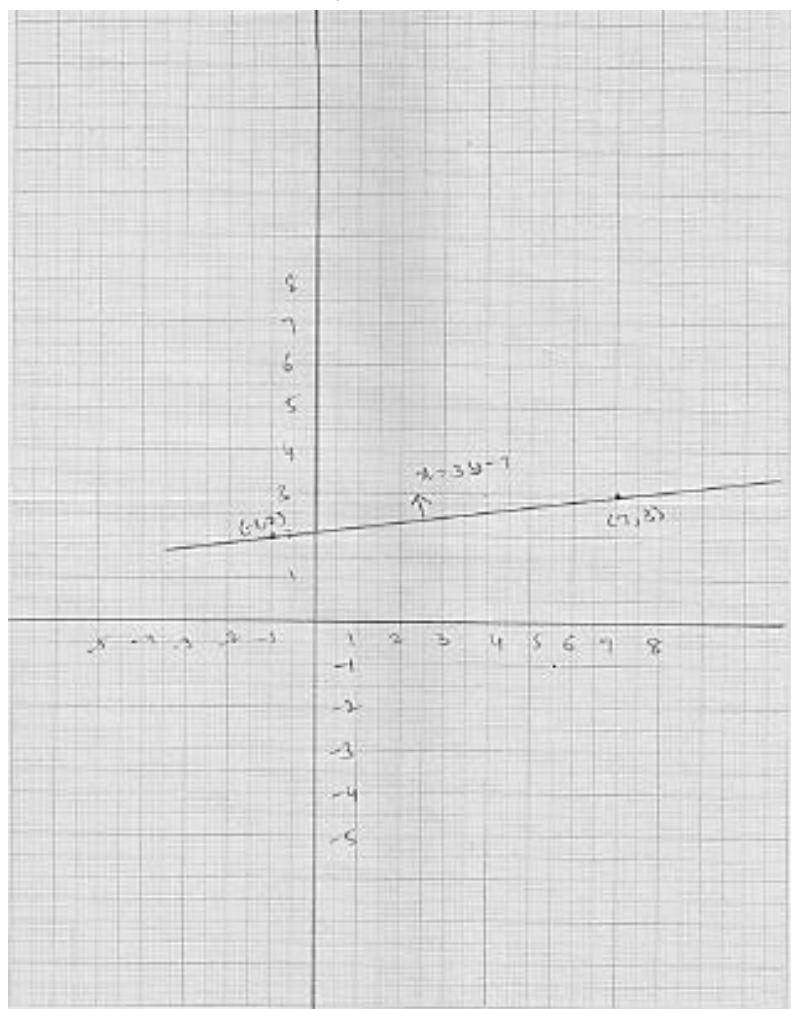
Putting $y = 2$, we get $x-3(2) = -7 \Rightarrow x = -1$

Putting $y = 3$, we get $x = 3(3)-7 \Rightarrow x = 2$

Thus, we get the following table giving the two points on the line represented by the

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

Graph for the equation $\frac{x-2}{y} = y-3$



(viii) We have

$$2y = -x + 1$$

$$\Rightarrow x - 1 = 2y \quad \dots\dots(1)$$

Putting $y = 0$, we get $x = 1 - 2 \times 0 = 1$

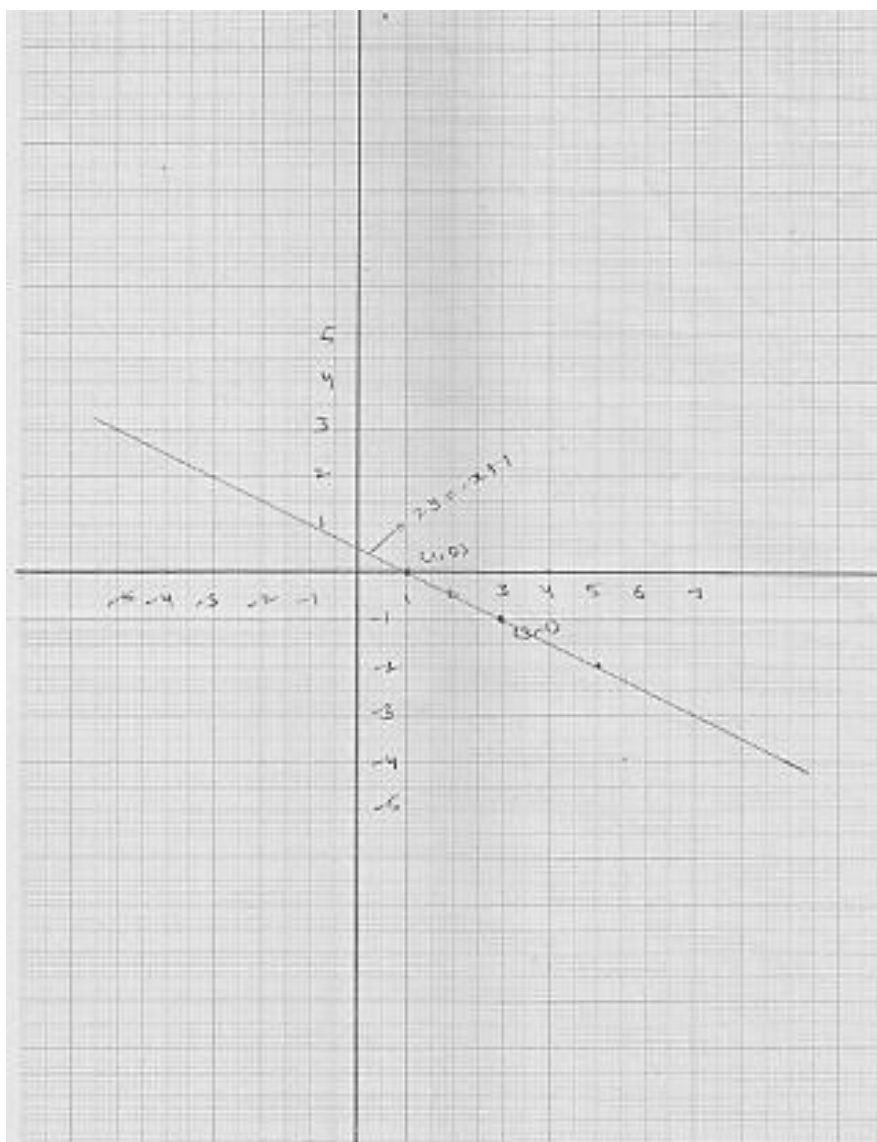
Putting $y = -1$, we get $x = 1 - 2(-1) = 3$

Thus, we have the following table giving the two points on the line represented by the equation

$$2y = x + 3$$

$$2y = -x + 1$$

Graph for the equation $2y = -x + 1$



2. Give the equations of two lines passing through (3, 12). How many more such lines are there, and why?

Sol:

The equation of two lines passing through (3,12) are

$$4x - y = 0$$

$$3x - y + 3 = 0 \quad \dots\dots(i)$$

There are infinitely many lines passing through (3,12)

3. A three-wheeler scooter charges Rs 15 for first kilometer and Rs 8 each for every subsequent kilometer. For a distance of x km, an amount of Rs y is paid. Write the linear equation representing the above information.

Sol:

Total fare of Rs y for covering distance of x kilometers is given by

$$y = 15 + 8(x - 1)$$

$$\Rightarrow y = 15 + 8x - 8$$

$$\Rightarrow y = 8x + 7$$

This is the required linear equation for the given information

4. A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Aarushi paid Rs 27 for a book kept for seven days. If fixed charges are Rs x and per day charges are Rs y . Write the linear equation representing the above information.

Sol:

Total charges paid by Aarushi is given by

$$27 = x + 4y$$

$$\Rightarrow x + 4y = 27$$

This is the required linear equation for the given information.

5. A number is 27 more than the number obtained by reversing its digits. If its unit's and ten's digit are x and y respectively, write the linear equation representing the above statement.

Sol:

Total original number is $10y + x$

The new number is obtained after reversing the order of digits is $10x + y$

According to question

$$\Rightarrow 10y + x = 10x + y + 27$$

$$\Rightarrow 9y - 9x = 27$$

$$\Rightarrow y - x = 3$$

$$\Rightarrow x - y + 3 = 0$$

This is the required linear equation for the given information.

6. The sum of a two digit number and the number obtained by reversing the order of its digits is 121. If units and ten's digit of the number are x and y respectively then write the linear equation representing the above statement.

Sol:

Total original number is $10y + x$

The new number is obtained after reversing the order of digits is $(10x + y)$

According to problem

$$(10y + x) + (10x + y) = 121$$

$$\Rightarrow 11x + 11y = 121$$

$$\Rightarrow 11(x + y) = 121$$

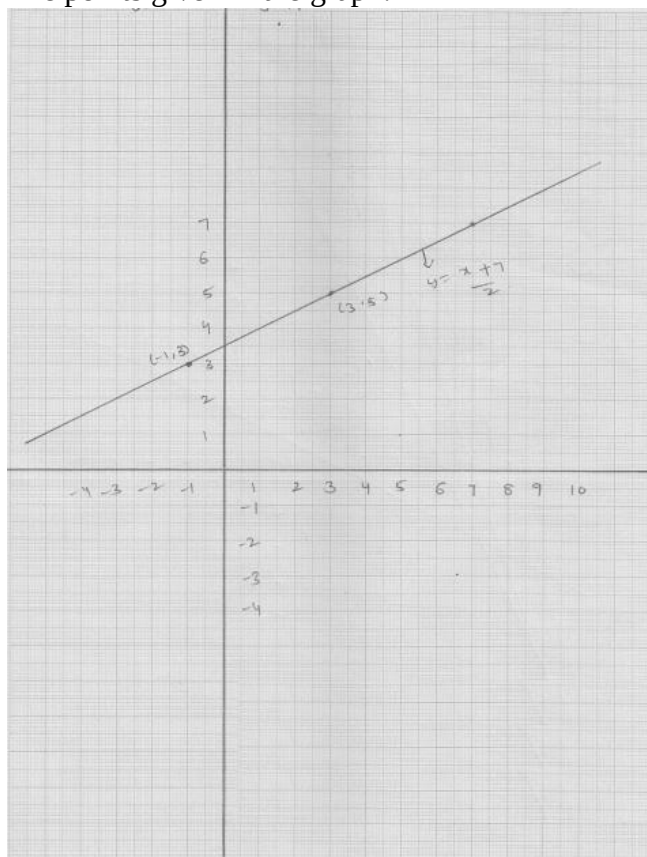
$$\Rightarrow x + y = 11$$

Thus is the required linear equation for the given information

7. Plot the points $(3, 5)$ and $(-1, 3)$ on a graph paper and verify that the straight line passing through these points also passes through the point $(1, 4)$.

Sol:

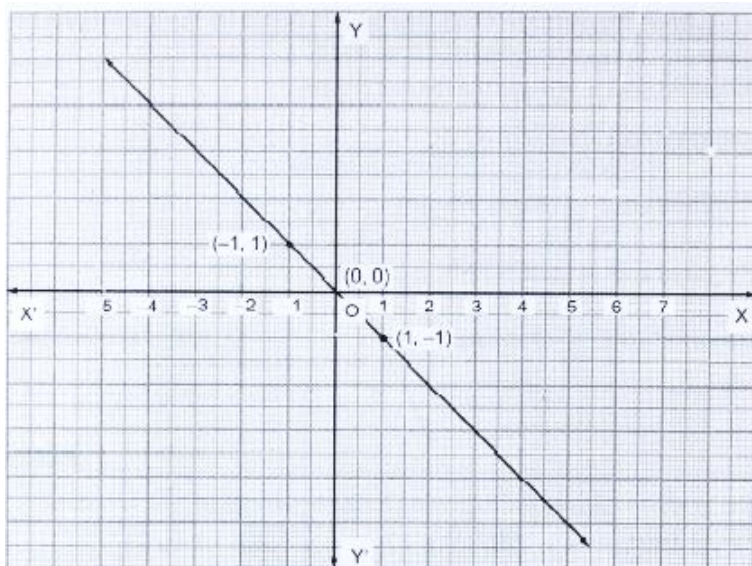
The points given in the graph:



It is clear from the graph the straight lines passes through these points also pass a through $(1, 4)$.

8. From the choices given below, choose the equation whose graph is given in Fig. below.

(i) $y = x$ (ii) $x + y = 0$ (iii) $y = 2x$ (iv) $2 + 3y = 7x$



[Hint: Clearly, $(-1, 1)$ and $(1, -1)$ satisfy the equation $x + y = 0$]

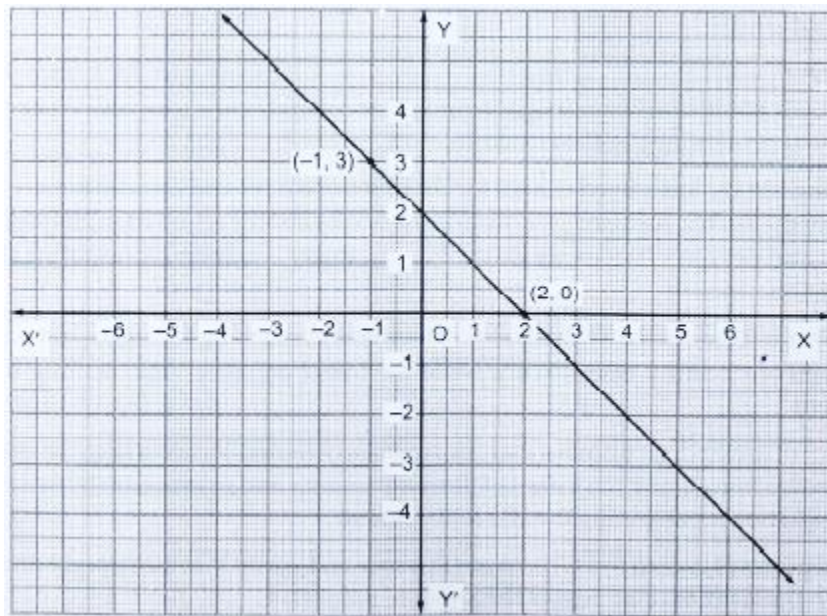
Sol:

Clearly $(-1, 1)$ and $(1, -1)$ satisfy the equation $x + y = 0$

$\therefore$ The equation whose graph is given by $x + y = 0$

9. From the choices given below, choose the equation whose graph is given in fig. below.

(i) $y = x + 2$ (ii) $y = x - 2$ (iii) $y = -x + 2$ (iv) $x + 2y = 6$



[Hint: Clearly, $(2, 0)$ and $(-1, 3)$ satisfy the equation $y = -x + 2$]

Sol:

Clearly $(2, 0)$ and $(-1, 3)$ satisfy the equation $y = -x + 2$

$\therefore$ The equation whose graph is given by $y = -x + 2$

10. If the point $(2, -2)$ lies on the graph of the linear equation $5x + ky = 4$, find the value of k .

Sol:

It is given that $(2, -2)$ is a solution of the equation $5x + ky = 4$

$$\therefore 5 \times 2 + k \times (-2) = 4$$

$$\Rightarrow 10 - 2k = 4$$

$$\Rightarrow -2k = 4 - 10$$

$$\Rightarrow -2k = -6$$

$$\Rightarrow k = 3.$$

11. Draw the graph of the equation $2x + 3y = 12$. From the graph, find the coordinates of the point: (i) whose y -coordinates is 3. (ii) whose x -coordinate is -3 .

Sol:

Graph of the equation $2x + 3y = 12$:

We have,

$$2x + 3y = 12$$

$$\Rightarrow 2x = 12 - 3y$$

$$\Rightarrow x = \frac{12 - 3y}{2}$$

Putting $y = 2$, we get $x = \frac{12 - 3 \times 2}{2} = 3$

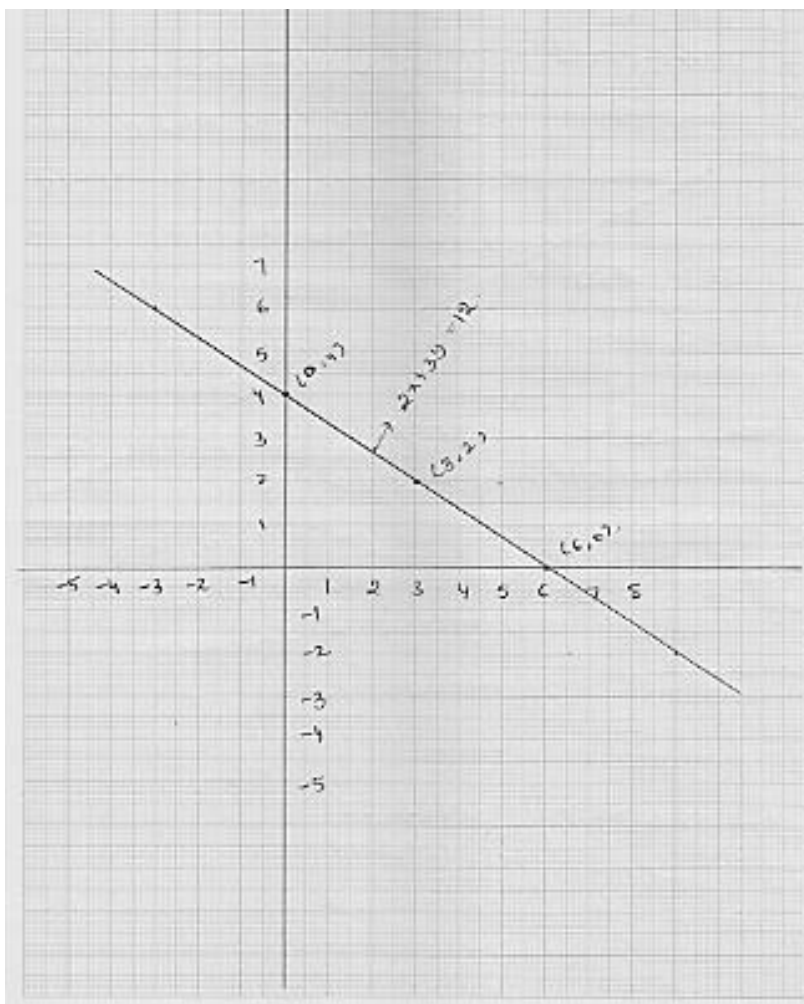
Putting $y = -4$, we get $x = \frac{12 - 3 \times 4}{2} = 0$

Thus, $(3, 0)$ and $(0, 4)$ are two points on the line $2x + 3y = 12$

The graph of line represents by the equation $2x + 3y = 12$

x	0	3
y	4	2

Graph of the equation $2x + 3y = 12$



- (i) To find coordinates of the points when $y = 3$, we draw a line parallel to x -axis and passing through $(0, 3)$ this line meets the graph of $2x + 3y = 12$ at a point p from which we draw a line parallel to y -axis which crosses x -axis at $x = \frac{3}{2}$, so the coordinates of the required points are $\left(\frac{3}{2}, 3\right)$.
- (ii) To find the coordinates of the points when $x = -3$ we draw a line parallel to y -axis and passing through $(-3, 0)$. This line meets the graph of $2x + 3y = 12$ at a point p from which we draw a line parallel to x -axis crosses y -axis at $y = 6$, so, the coordinates of the required point are $(-3, 6)$.

12. Draw the graph of each of the equations given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

(i) $6x - 3y = 12$

(ii) $-x + 4y = 8$

(iii) $2x + y = 6$

(iv) $3x + 2y + 6 = 0$

Sol:

(i) We have

$$6x - 3y = 12$$

$$\Rightarrow 3(2x - y) = 12$$

$$\Rightarrow 2x - y = 4$$

$$\Rightarrow 2x - 4 = y$$

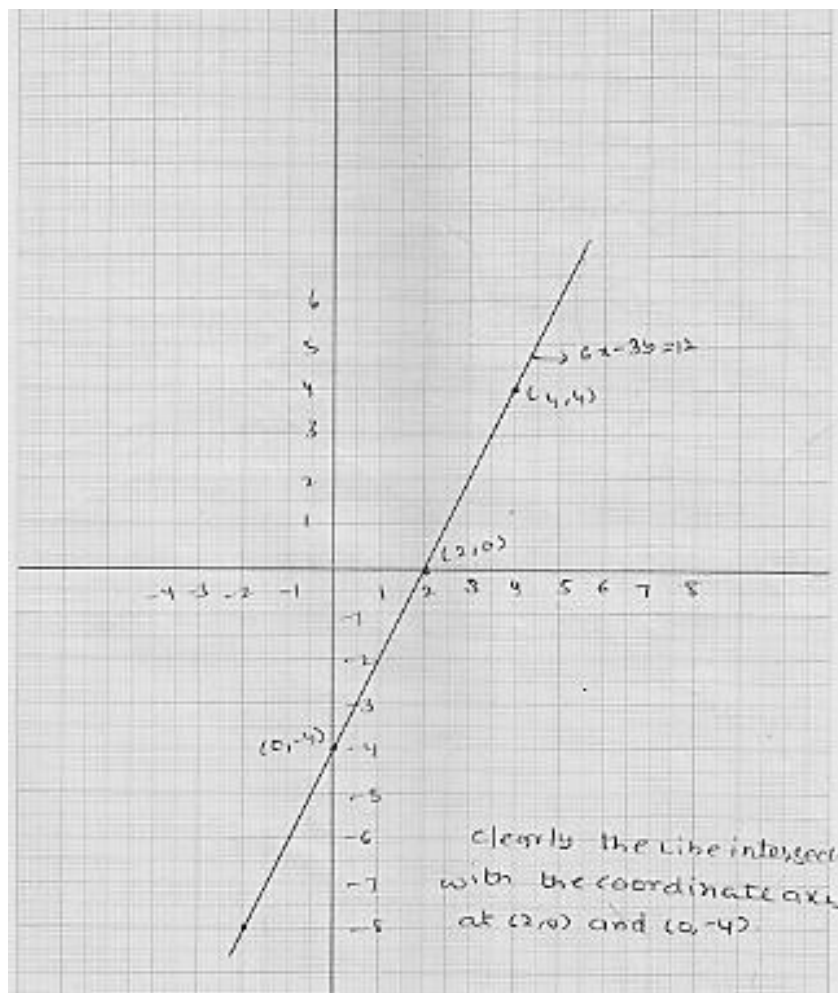
$$\Rightarrow y = 2x - 4 \quad \dots\dots(i)$$

Putting $x = 0$ in (i), we get $y = -4$

Putting $x = 2$ in (i), we get $y = 0$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $6x - 3y = 12$.

The graph of the line $6x - 3y = 12$



(ii) We have

$$-x + 4y = 8$$

$$\Rightarrow 4y - 8 = x$$

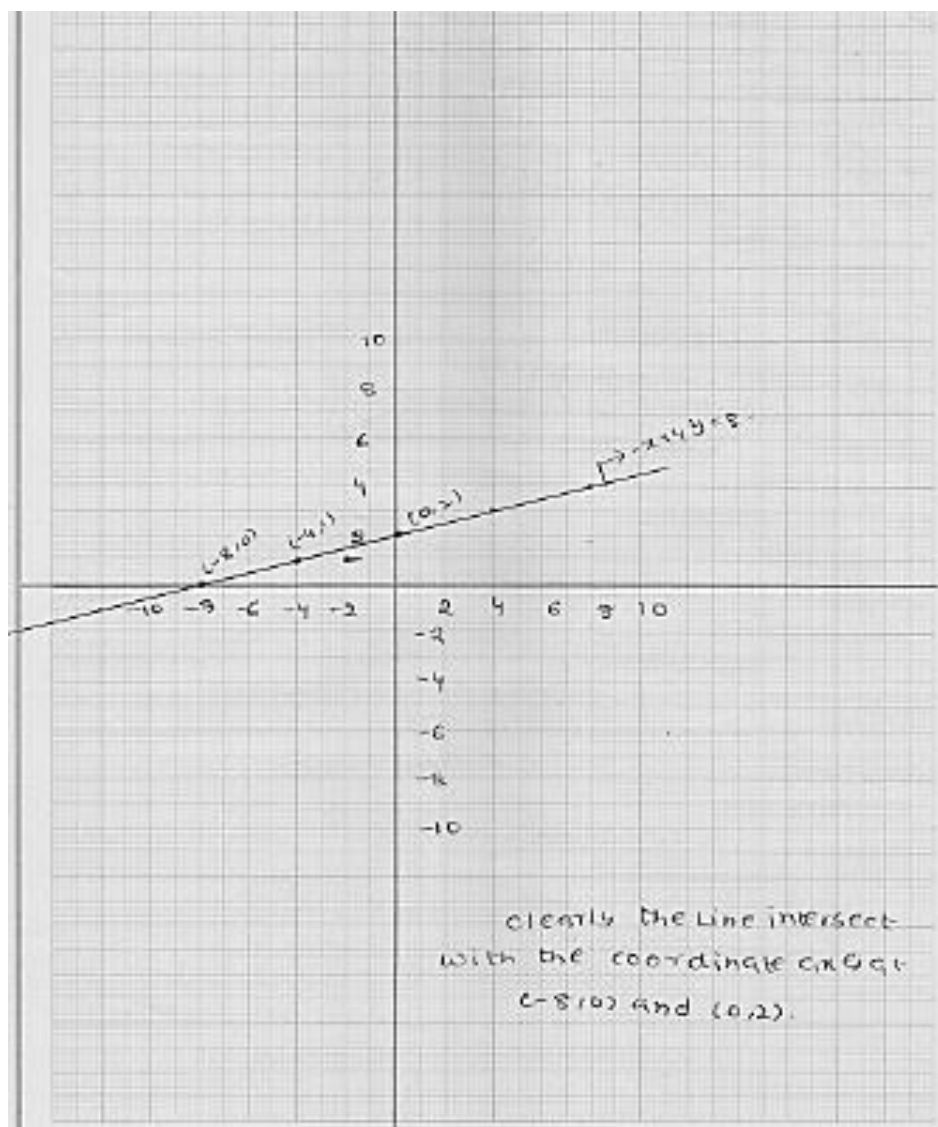
$$\Rightarrow x = 4y - 8$$

Putting $y = 1$ in (i), we get $x = 4 \times 1 - 8 = -4$

Putting $y = 2$ in (i), we get $x = 4 \times 2 - 8 = 0$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $-x + 4y = -8$

Graph of the equation $-x + 4y = 8$



(iii) We have

$$2x + y = 6$$

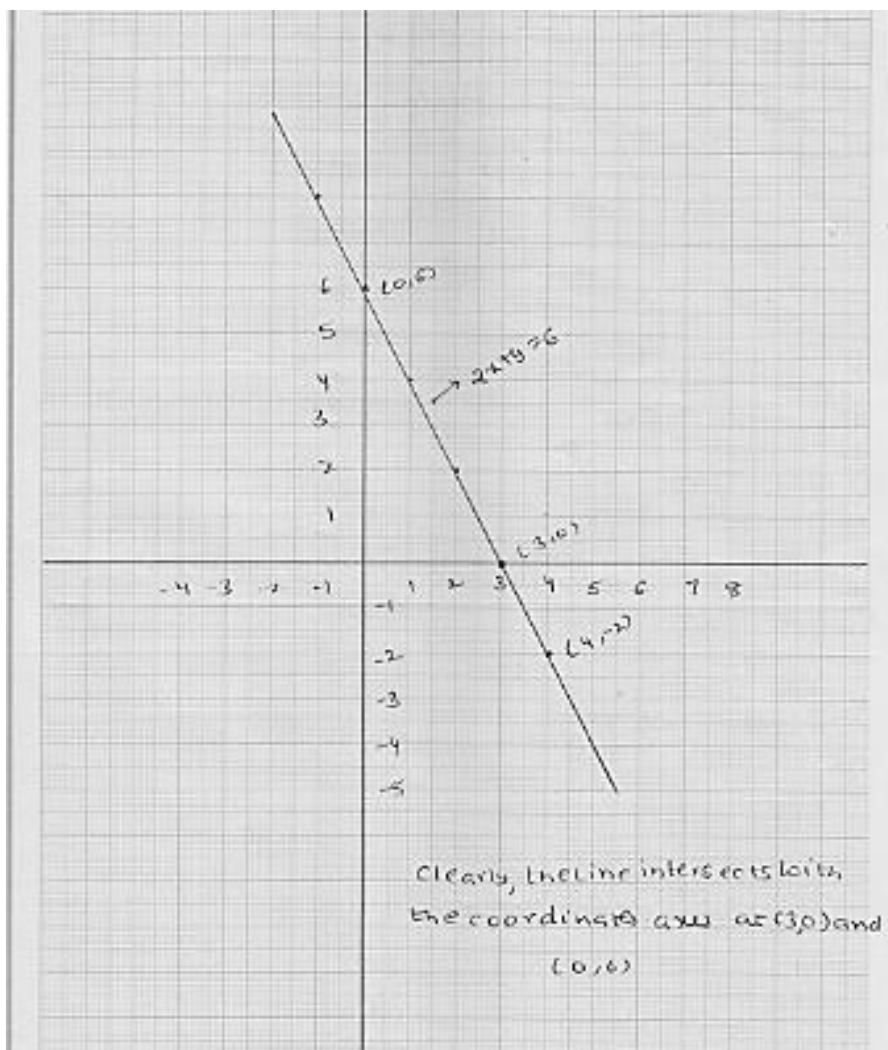
$$\Rightarrow y = 6 - 2x \quad \dots\dots(i)$$

Putting $x=3$ in (i), we get $y=6-2\times 3=0$

Putting $x=4$ in (i), we get $y=6-2\times 4=-2$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $2x+y=6$

Graph of the equation $2x+y=6$



(iv) We have

$$3x + 2y + 6 = 0$$

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

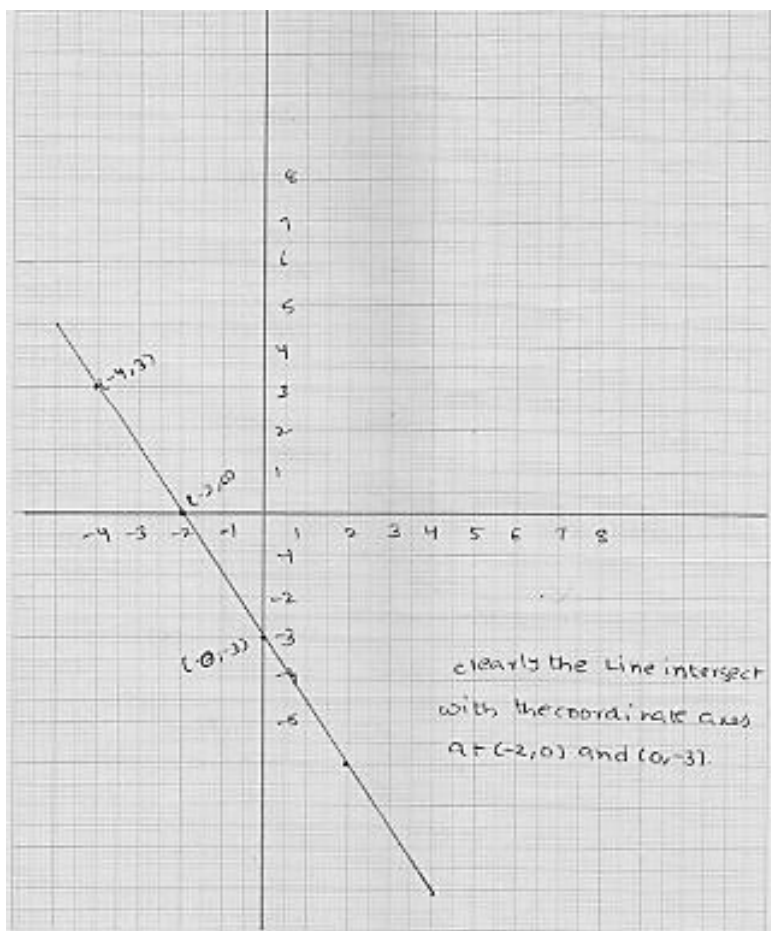
$$\Rightarrow y = \frac{-6 - 3x}{2}$$

Putting $x=-2$ in (i), we get $x = \frac{6 - 3(-2)}{2} = 0$

Putting $x=-4$ in (i), we get $y = \frac{6 - 3(-4)}{2} = 3$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $3x + 2y + 6 = 0$

Graph of the equation $3x - 2y + 6 = 0$



13. Draw the graph of the equation $2x + y = 6$. Shade the region bounded by the graph and the coordinate axes. Also, find the area of the shaded region.

Sol:

We have

$$2x + y = 6$$

$$y = 6 - 2x \quad \dots\dots(i)$$

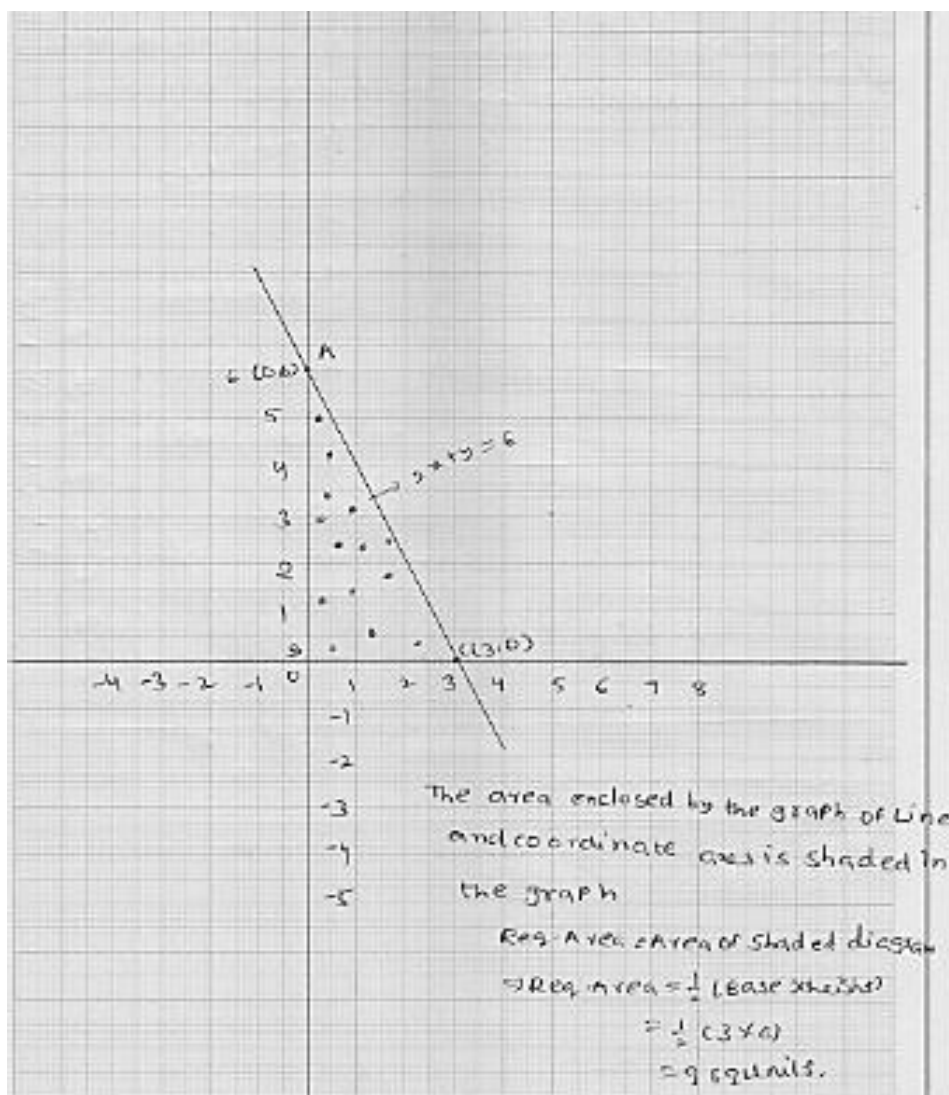
Putting $x = 3$ in (i), we get $y = 6 - 2 \times 3 = 0$

Putting $x = 0$ in (i), we get $y = 6 - 2 \times 0 = 6$

Thus, we obtained the following table giving coordinates of two points on the line represented by the equation $2x + y = 6$

x	3	0
y	0	6

The graph of line $2x + y = 6$



14. Draw the graph of the equation $\frac{x}{3} + \frac{y}{4} = 1$. Also, find the area of the triangle formed by the line and the co-ordinates axes.

Sol:

We have

$$\frac{x}{3} + \frac{y}{4} = 1$$

$$\Rightarrow 4x + 3y = 12$$

$$\Rightarrow 4x = 12 - 3y$$

$$\Rightarrow x = \frac{12 - 3y}{4}$$

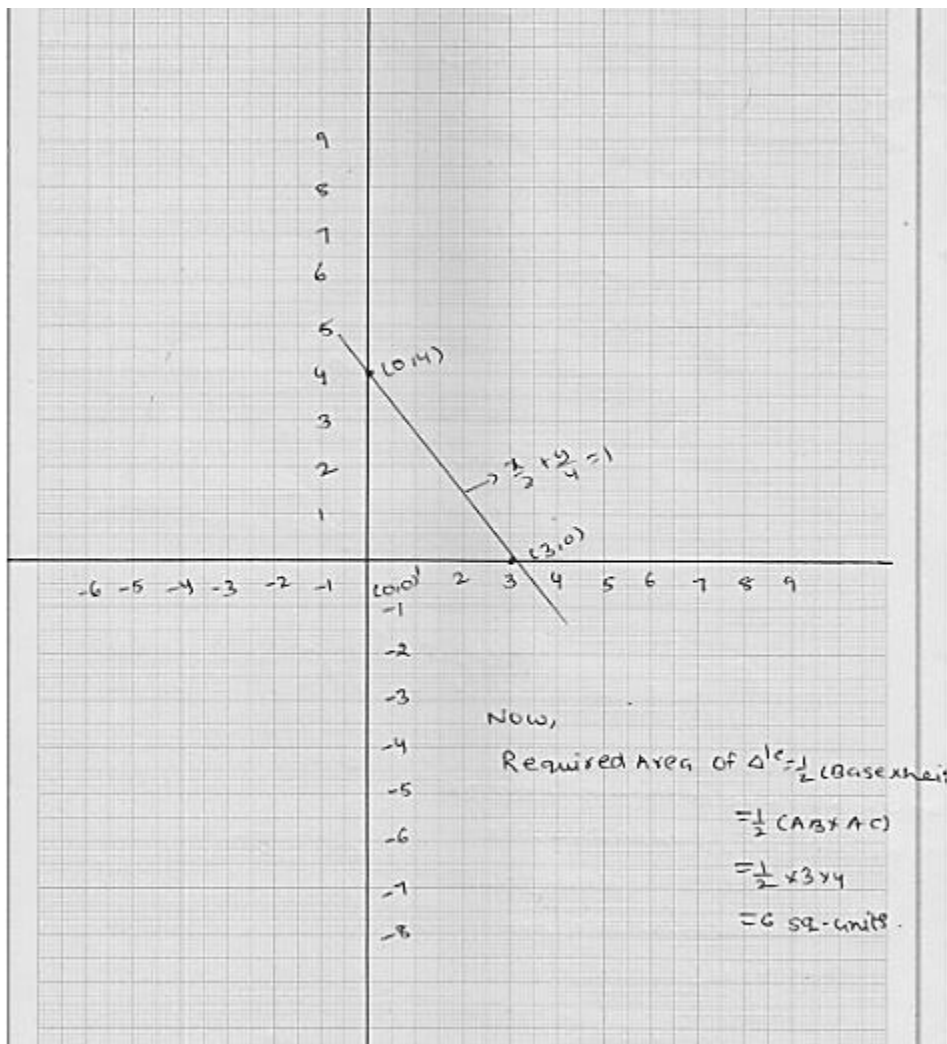
Putting $y = 0$ in (i), we get $x = \frac{12 - 3 \times 0}{4} = 3$

Putting $y = -4$ in (ii), we get $x = \frac{12 - 3 \times 4}{4} = 0$

Thus, we obtained the following table giving coordinates of two points on the line represents by the equation $\frac{x}{3} + \frac{y}{4} = 1$.

x	0	3
y	4	0

The graph of line $\frac{x}{3} + \frac{y}{4} = 1$.



15. Draw the graph of $y = |x|$.

Sol:

We have

$$y = |x| \quad \dots\dots(i)$$

Putting $x = 0$, we get $y = 0$

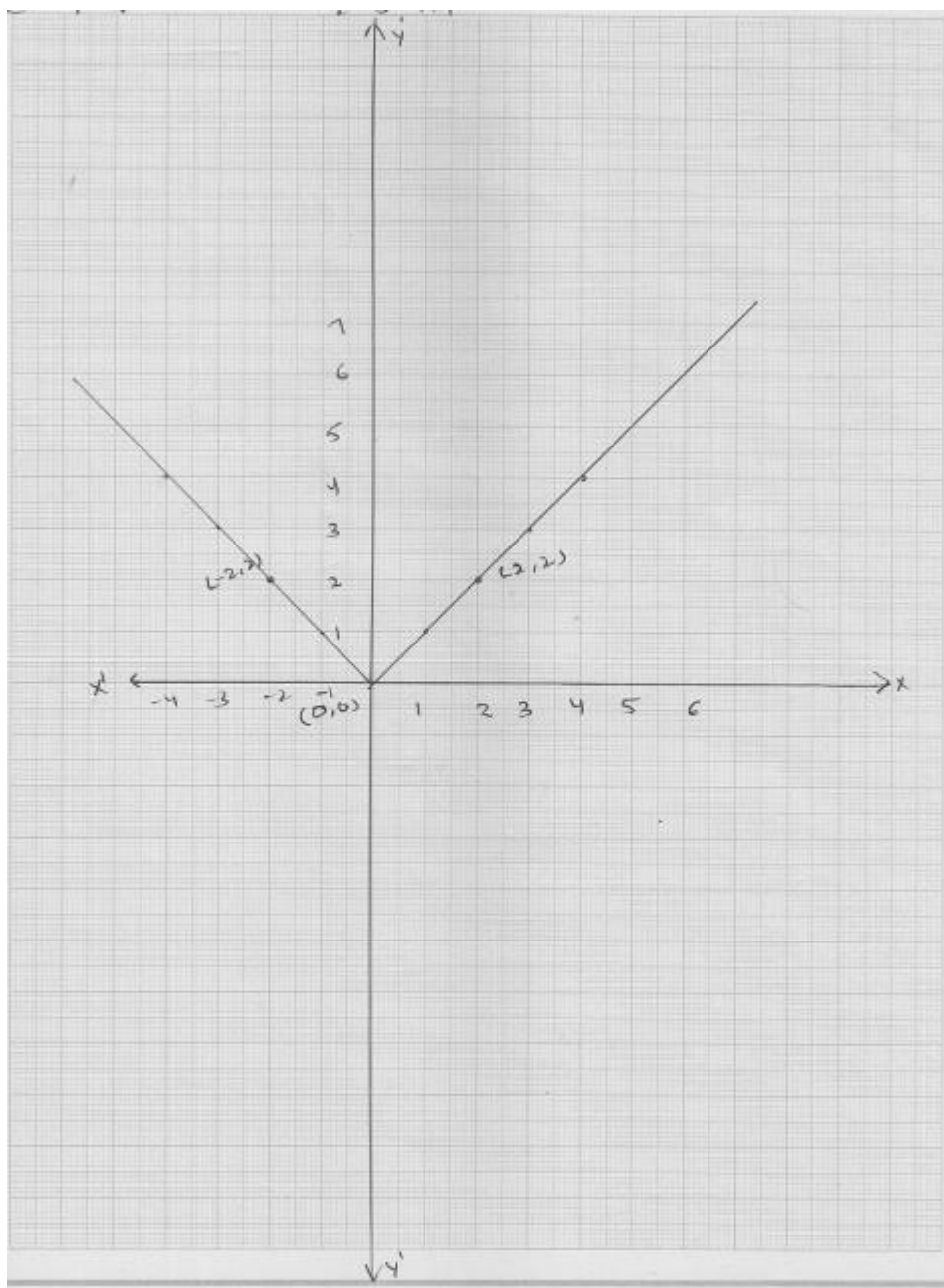
Putting $x = 2$, we get $y = 2$

Putting $x = -2$, we get $y = 2$

Thus, we have the following table for the two points on graph of $|x|$

x	0	2	-2
y	0	2	2

Graph of line equation $y = |x|$



16. Draw the graph of $y = |x| + 2$.

Sol:

We have

$$y = |x| + 2 \quad \dots\dots(i)$$

Putting $x = 0$, we get $y = 2$

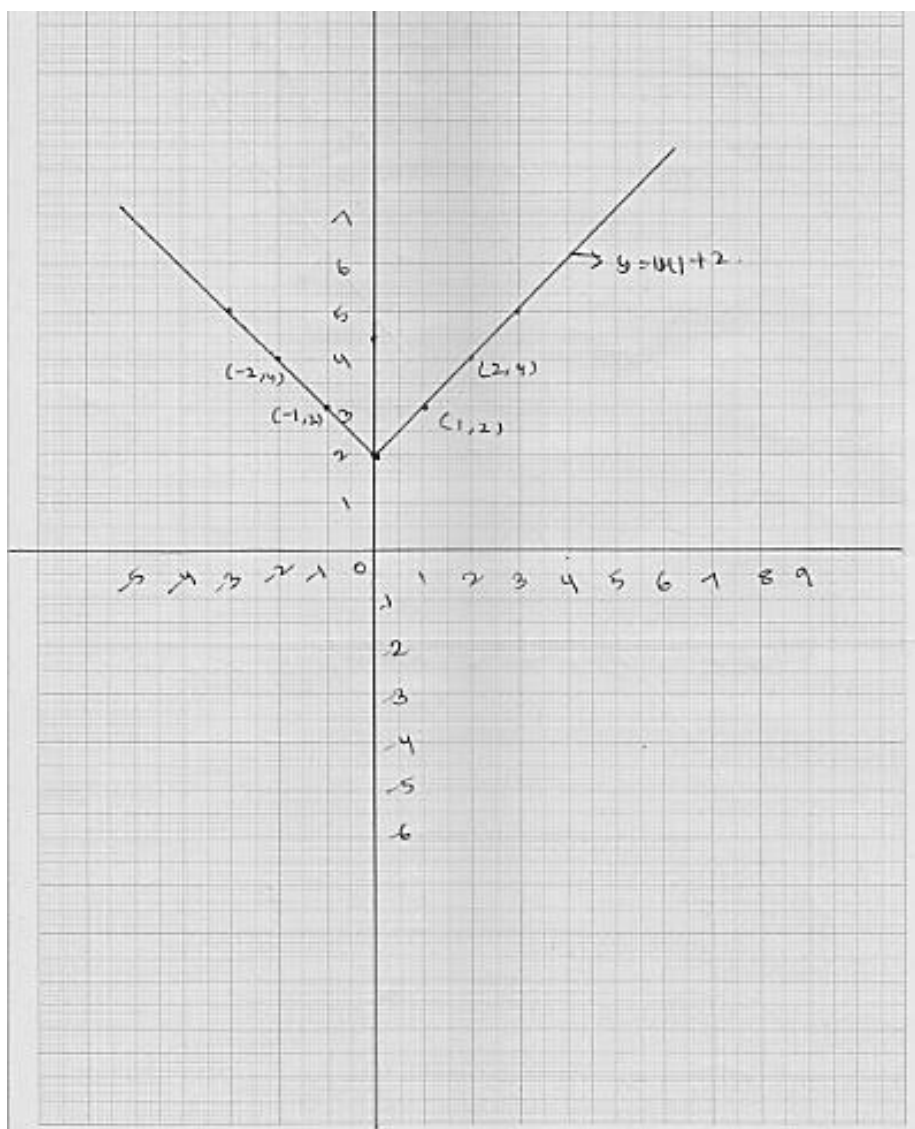
Putting $x = 1$, we get $y = 3$

Putting $x = -1$, we get $y = 3$

Thus, we have the following table for the points on graph of $|x| + 2$

x	0	1	-1
y	2	3	3

Graph of line equation $y = |x| + 2$



17. Draw the graphs of the following linear equations on the same graph paper: $2x + 3y = 12$, $x - y = 1$.

Find the coordinates of the vertices of the triangle formed by the two straight lines and the y-axis. Also, find the area of the triangle.

Sol:

Graph of the equation $2x + 3y - 12 = 0$

We have

$$2x + 3y = 12$$

$$\Rightarrow 2x = 12 - 3y$$

$$\Rightarrow x = \frac{12 - 3y}{2}$$

Putting $y = 4$, we get $x = \frac{12 - 3 \times 4}{2} = 0$

Putting $y = 2$, we get $x = \frac{12 - 3 \times 2}{2} = 3$

Thus, we have the following table for the points on the line $2x + 3y = 12$

x	0	3
y	4	2

Plotting points $A(0, 4)$, $B(3, 2)$ on the graph paper and drawing a line passing through them we obtain graph of the equation.

Graph of the equation

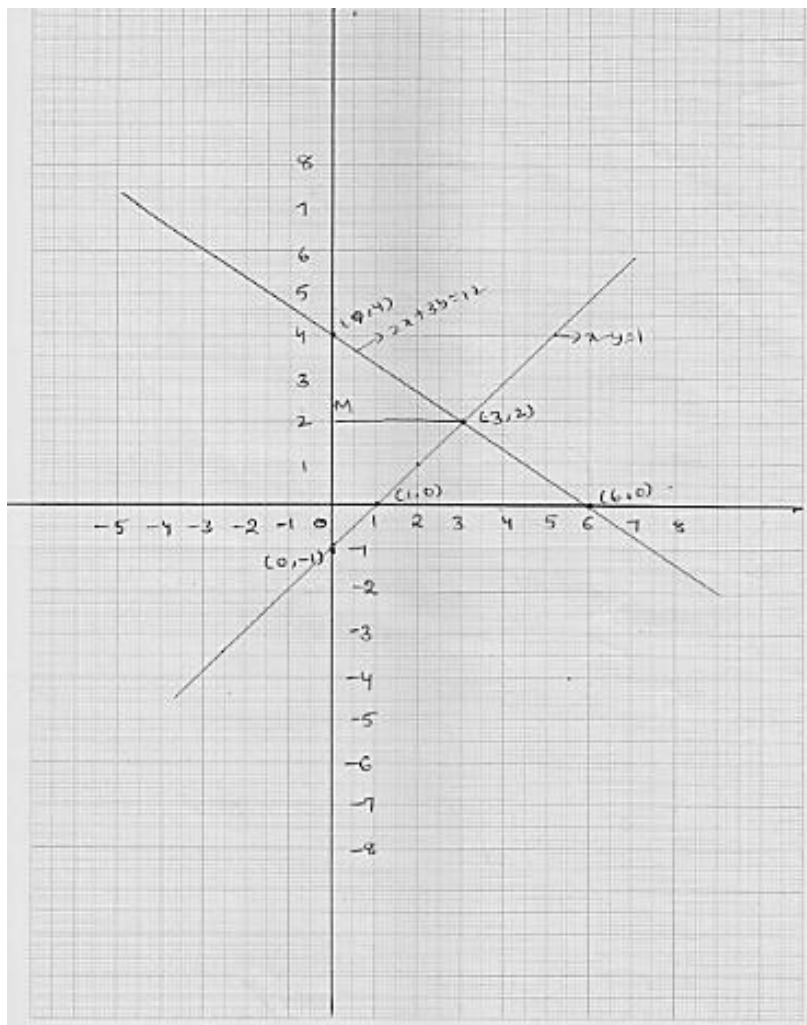
Graph of the equation $x - y - 1 = 0$:

We have $x - y = 1 \Rightarrow x = 1 + y$

Thus, we have the following table for the points on the line $x - y = 1$

x	1	0
y	0	-1

Plotting points $C(1, 0)$ and $D(0, -1)$ on the same graph paper drawing a line passing through them, we obtain the graph of the line represented by the equation $x - y = 1$.



Clearly two lines intersect at $A(3, 2)$.

The graph of line $2x + 3y = 12$ intersects with y -axis at $B(0, 4)$ and the graph of the line $x - y = 1$ intersects with y -axis at $C(0, -1)$.

So, the vertices of the triangle formed by these two straight lines and y -axis are $A(3, 2)$ and $B(0, 4)$ and $C(0, -1)$.

Now,

$$\text{Area of } \triangle ABC = \frac{1}{2} [\text{Base} \times \text{Height}]$$

$$= \frac{1}{2} (BC \times AB)$$

$$= \frac{1}{2} (5 + 3)$$

$$= \frac{15}{2} \text{ sq. units}$$

18. Draw the graphs of the linear equations $4x - 3y + 4 = 0$ and $4x + 3y - 20 = 0$. Find the area bounded by these lines and x-axis.

Sol:

We have

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

$$\Rightarrow 4x - 3y = -4$$

$$\Rightarrow x = \frac{3y - 4}{4}$$

Putting $y = 0$, we get $x = \frac{3 \times 0 - 4}{4} = -1$

Putting $y = 4$, we get $x = \frac{3 \times 4 - 4}{4} = 2$

Thus, we have the following table for the points on the line $4x - 3y + 4 = 0$

x	-1	2
y	0	4

We have

$$4x + 3y - 20 = 0$$

$$\Rightarrow 4x = 20 - 3y$$

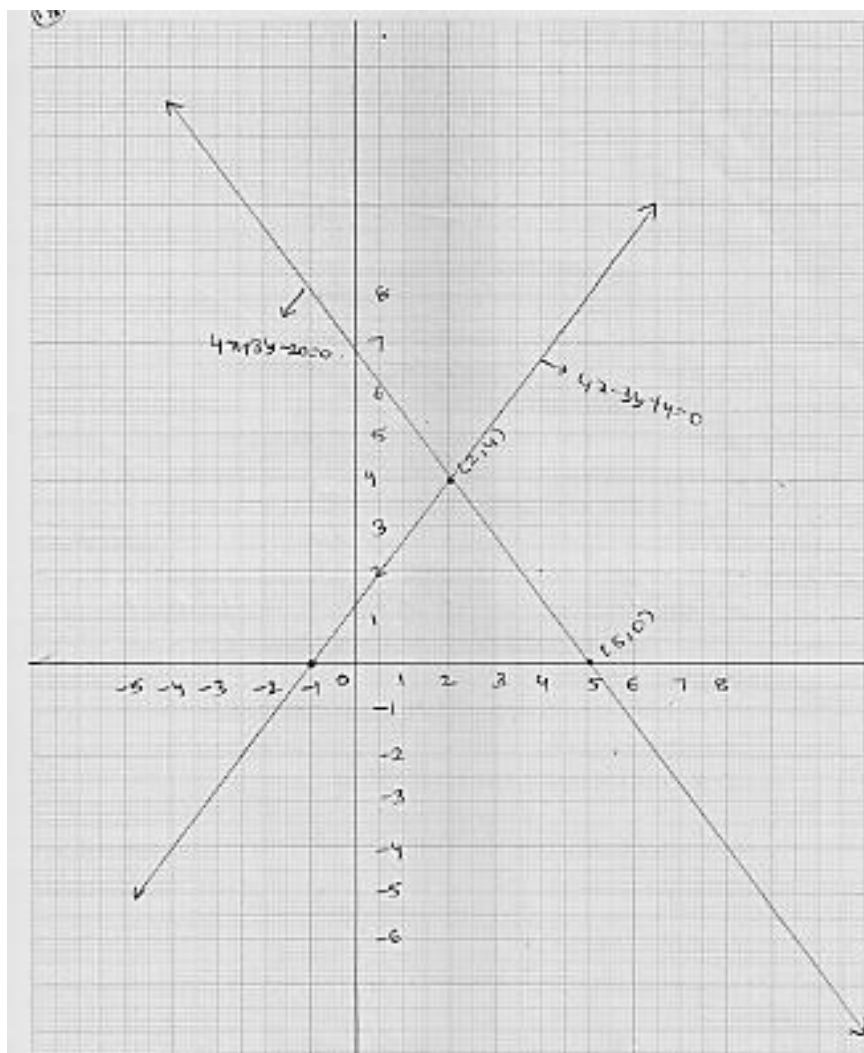
$$\Rightarrow x = \frac{20 - 3y}{4}$$

Putting $y = 0$, we get $x = \frac{20 - 3 \times 0}{4} = 5$

Putting $y = 4$, we get $x = \frac{20 - 3 \times 4}{4} = 2$.

Thus, we have the following table for the points on the line $4x + 3y - 20 = 0$

x	0	2
y	0	4



Clearly, two lines intersect at $A(2, 4)$.

The graph of the lines $4x - 3y + 4 = 0$ and $4x + 3y - 20 = 0$ intersect with y -axis at $a + B(-1, 0)$ and $c(5, 0)$ respectively

$$\therefore \text{Area of } \triangle ABC = \frac{1}{2} [\text{Base} \times \text{height}]$$

$$= \frac{1}{2} (BC \times AB)$$

$$= \frac{1}{2} (6 \times 4)$$

$$= 3 \times 4$$

$$= 12 \text{ sq. units}$$

$$\therefore \text{Area of } \triangle ABC = 12 \text{ sq. units}$$

19. The path of a train A is given by the equation $3x + 4y - 12 = 0$ and the path of another train B is given by the equation $6x + 8y - 48 = 0$. Represent this situation graphically.

Sol:

We have,

$$3x + 4y - 12 = 0$$

$$\Rightarrow 3x = 12 - 4y$$

$$\Rightarrow 3x = \frac{12 - 4y}{3}$$

Putting $y = 0$, we get $x = \frac{12 - 4 \times 0}{3} = 4$

Putting $y = 3$, we get $x = \frac{12 - 4 \times 3}{3} = 0$

Thus, we have the following table for the points on the line $3x + 4y - 12 = 0$:

x	4	0
y	0	3

We have

$$6x + 8y - 48 = 0$$

$$6x + 8y = 48$$

$$6x = 48 - 8y$$

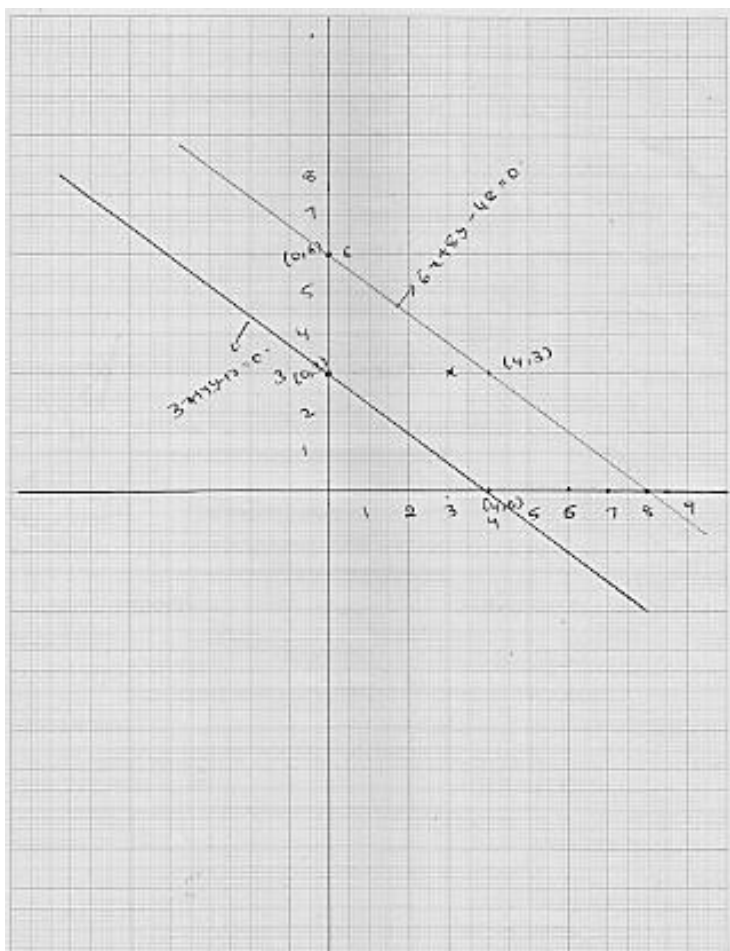
$$x = 48 - \frac{8y}{6}$$

Putting $y = 6$, we get $x = \frac{48 - 8 \times 6}{6} = 0$

Putting $y = 4$, we get $x = \frac{48 - 8 \times 3}{6} = 4$

Thus, we have the following table for the points on the line $6x + 8y - 48 = 0$

x	0	4
y	6	3



20. Ravish tells his daughter Aarushi, “Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be”. If present ages of Aarushi and Ravish are x and y years respectively, represent this situation algebraically as well as graphically.

Sol:

It is given that seven year ago Harish was seven times a sold as his daughter

$$\therefore 7(x - y) = y - 7$$

$$\Rightarrow 7x - 49 = y - 7$$

$$\Rightarrow 7x - 42 = y \quad \text{.....(i)}$$

It is also given that after three years from now Ravish shall be three times a sold as her daughter

$$\therefore 3(x + 3) = y + 3 \Rightarrow 3x + 9 = y + 3 \Rightarrow 3x + 6 = y \quad \text{.....(ii)}$$

$$\text{Now, } y = 7x - 42 \quad [\text{using (i)}]$$

$$\text{Putting } x = 6, \text{ we get } y = 7 \times 6 - 42 = 0$$

$$\text{Putting } x = 5, \text{ we get } y = 7 \times 5 - 42 = -7$$

Thus, we have following table for the points on the

Line $7x - 42 = y$:

x	6	5
y	0	-7

We have,

$$y = 3x + 6 \quad [\text{using (ii)}]$$

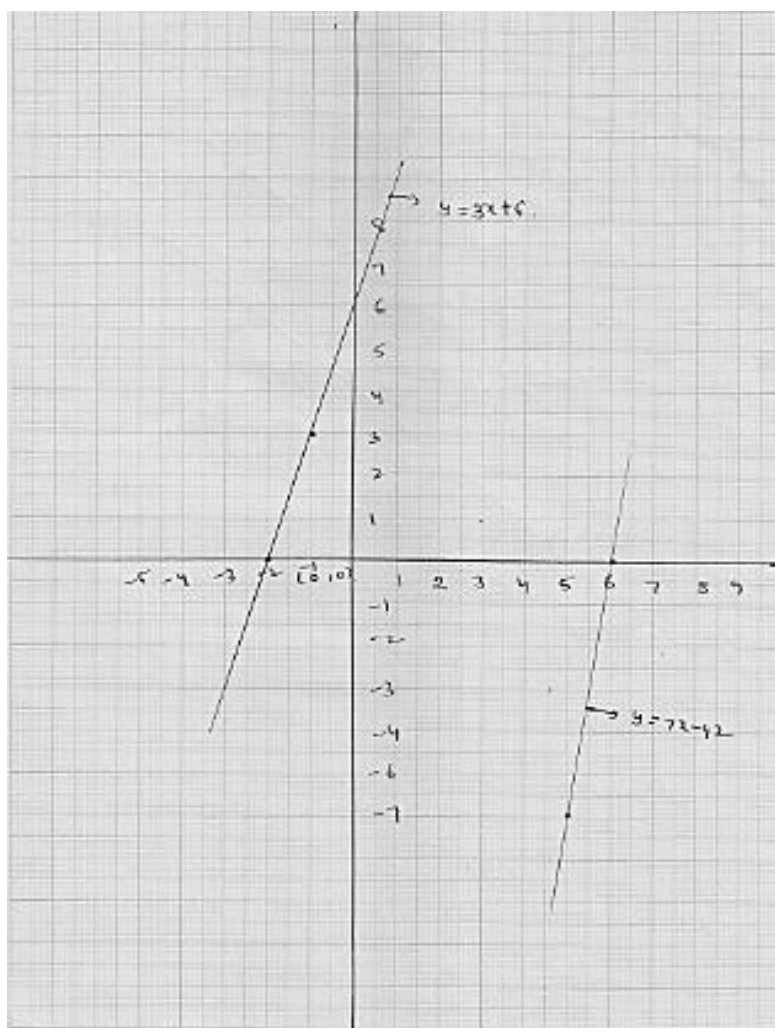
Putting $x = -2$, we get $y = 3 \times (-2) + 6 = 0$

Putting $x = -1$, we get $y = 3 \times (-1) + 6 = 3$

Thus, we have following table for the points on the

Line $y = 3x + 6$:

x	-1	-2
y	3	0



21. Aarushi was driving a car with uniform speed of 60 km/h. Draw distance-time graph. From the graph, find the distance travelled by Aarushi in

(i) $2\frac{1}{2}$ Hours

(ii) $\frac{1}{2}$ Hour

Sol:

Let x be the time and y be the distance travelled by Aarushi

It is given that speed of car is 60 km/h

$$\text{We know that speed} = \frac{\text{distance}}{\text{time}}$$

$$\Rightarrow 60 = \frac{y}{x}$$

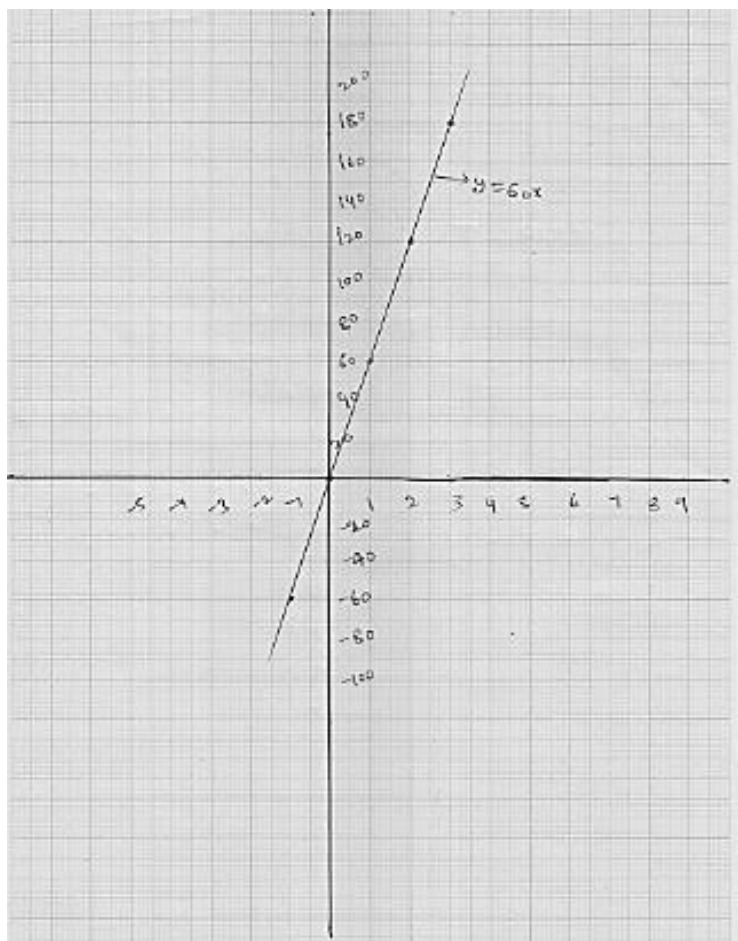
$$\Rightarrow y = 60x$$

Putting $x = 1$, we get $y = 60$

Putting $x = 2$, we get $y = 120$

Thus, we have the following table for the points on the line $y = 60x$

x	1	2
y	60	120



Exercise – 13.4

1. Give the geometric representations of the following equations

(a) on the number line

(b) on the Cartesian plane:

(i) $x = 2$

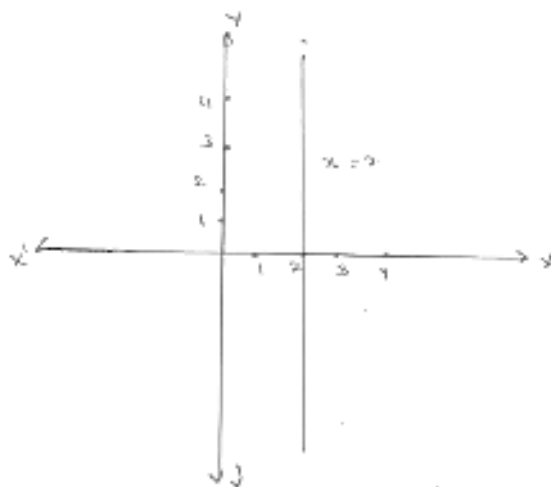
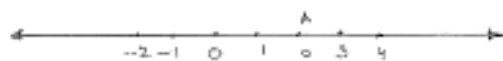
(ii) $y + 3 = 0$

(iii) $y = 3$

(iv) $2x + 9 = 0$ (v) $3x - 5 = 0$

Sol:

(i)

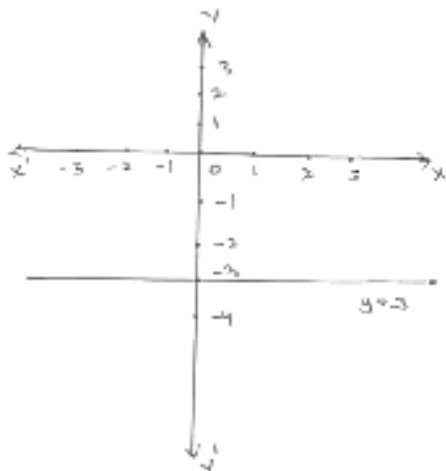


$x = 2$

Point A represents $x = 2$ number line

On Cartesian plane, equation represents all points on y -axis for which $x = 2$

(ii)



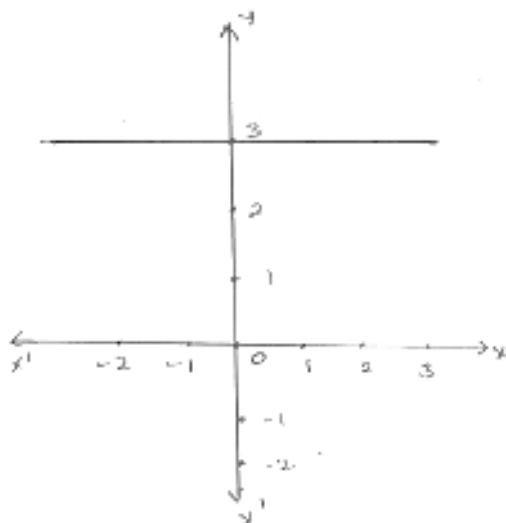
$$y + 3 = 0$$

$$y = -3$$

Point A represents -3 on number line

On Cartesian plane equation represents all the points on x -axis for which $y = -3$.

(iii)

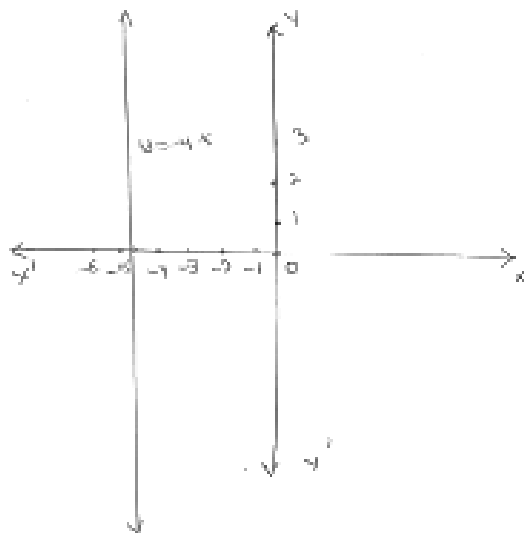


$$y = 3.$$

Point A represents 3 on number line

On Cartesian plane, equation represents all points on x -axis for which $y = 3$

(iv)



$$2x + 9 = 0$$

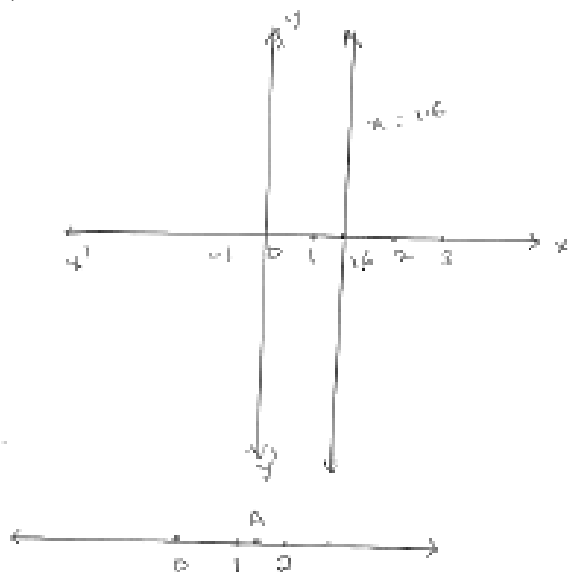
$$2x = -9$$

$$x = \frac{-9}{2} = -4.5$$

Point A represents -4.5 on number line

On Cartesian plane, equation represents all points on y -axis for which $x = -4.5$

(v)



$$3x - 5 = 0$$

$$3x = 5$$

$$x = \frac{5}{3} = 1.6 \text{ (Approx)}$$

Point A represents $1\frac{1}{2}$ (or) $\frac{5}{3}$ on number line

On Cartesian plane, equation represents all points on y -axis for which $x = 1.6$

2. Give the geometrical representation of $2x + 13 = 0$ as an equation in
(i) one variable (ii) two variables

Sol:

(i)



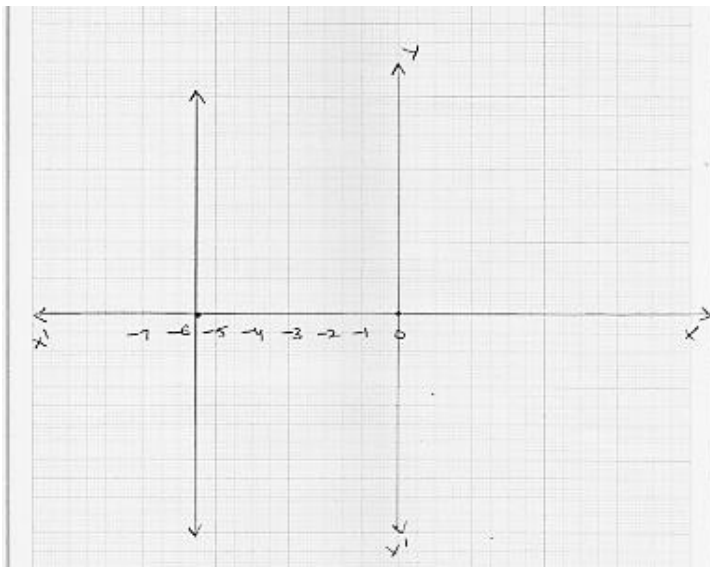
One variable representation of $2x + 13 = 0$

$$2x = -13$$

$$x = \frac{-13}{2} = -6\frac{1}{2}$$

Points A represents $\frac{-13}{2}$

(ii)



Two variable representation of $2x + 13 = 0$

$$2x + 0y + 13 = 0$$

$$2x + 13 = 0$$

$$2x = -13$$

$$x = \frac{-13}{2}$$

$$x = -6.5$$

On Cartesian plane, equation represents all points y -axis for which $x = -6.5$.

3. Solve the equation $3x + 2 = x - 8$, and represent the solution on (i) the number line (ii) the Cartesian plane.

Sol:

(i)



$$3x + 2 = x - 8$$

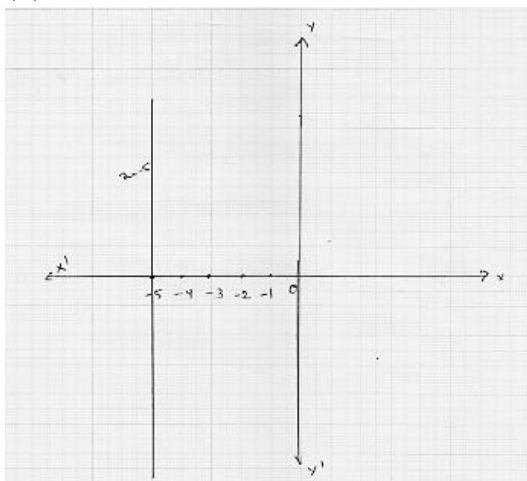
$$\Rightarrow 3x - x = 8 - 2$$

$$\Rightarrow 2x = -10$$

$$\Rightarrow x = -5$$

Points A represents -5 on number line

(ii)



On Cartesian plane, equation represents all points on y -axis for which $x = 5$

4. Write the equation of the line that is parallel to x -axis and passing through the point
 (i) $(0, 3)$ (ii) $(0, -4)$ (iii) $(2, -5)$ (iv) $(3, 4)$

Sol:

- (i) The equation of the line that is parallel to x -axis and passing through the point $(0, 3)$ is $y = 3$.
 (ii) The equation of the line that is parallel to x -axis and passing through the point $(0, -4)$ is $y = -4$.
 (iii) The equation of the line that is parallel to x -axis and passing through the point $(2, -5)$ is $y = -5$.
 (iv) The equation of the line that is parallel to x -axis and passing through the point $(-4, -3)$ is $y = -3$.

5. Write the equation of the line that is parallel to y -axis and passing through the point
 (i) $(4, 0)$ (ii) $(-2, 0)$ (iii) $(3, 5)$ (iv) $(-4, -3)$

Sol:

- (i) The equation of the line that is parallel to y -axis and passing through $(4, 0)$ will be $x = 4$.
 (ii) The equation of the line that is parallel to y -axis and passing through $(-2, 0)$ will be $x = -2$.
 (iii) The equation of the line that is parallel to y -axis and passing through $(3, 5)$ will be $x = 3$.
 (iv) The equation of the line that is parallel to y -axis and passing through $(-4, -3)$ will be $x = -4$.