RD Sharma Solutions for Class 9 Chapter 13 Linear Equations in Two Variables

Question 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 (ii) x – y/2 – 5 = 0 (iii) 2x + 3y = 9.35

(iv) 3x = -7y (v) 2x + 3 = 0 (vi) y – 5 = 0

(vii) 4 = 3x (viii) y = x/2

Solution:

(i) Given equation, -2x + 3y = 12

Or – 2x + 3y – 12 = 0

Comparing the given equation with ax + by + c = 0

We get, a = – 2; b = 3; c = -12

(ii) Given equation, x – y/2 – 5= 0

Comparing the given equation with ax + by + c = 0 ,

We get, a = 1; b = -1/2, c = -5

(iii) Given equation, 2x + 3y = 9.35

or 2x + 3y – 9.35 =0

Comparing the given equation with ax + by + c = 0

We get, a = 2 ; b = 3 ; c = -9.35

(iv) Given equation, 3x = -7y

or 3x + 7y = 0

Comparing the given equation with ax+ by + c = 0,

We get, a = 3 ; b = 7 ; c = 0

(v) Given equation, 2x + 3 = 0

or 2x + 0y + 3 = 0

Comparing the given equation with ax + by + c = 0,

We get, a = 2 ; b = 0 ; c = 3

(vi) Given equation, y – 5 = 0

or 0x + y – 5 = 0

Comparing the given equation with ax + by+ c = 0,

We get, a = 0; b = 1; c = -5

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(vii) Given equation, 4 = 3x

or 3x + 0y – 4 = 0

Comparing the given equation with ax + by + c = 0,

We get, a = 3; b = 0; c = -4

(viii) Given equation, y = x/2

Or x – 2y = 0

Or x – 2y + 0 = 0

Comparing the given equation with ax + by + c = 0 ,

We get, a = 1; b = -2; c = 0

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

(i) 2x = -3 (ii) y=3 (iii) 5x = 7/ 2 (iv) y = 3/2x

Solution:

(i) Given equation, 2x = -3

The above equation can be written in two variables as,

2x + 0y + 3 = 0

(ii) Given equation, y = 3

The above equation can be written in two variables as,

0 x + y – 3 = 0

(iii) Given equation, 5x = 7/2

The above equation can be written in two variables as,

5x + 0y – 7/2 = 0

or 10x + 0y – 7 = 0

(iv) Given equation, y = 3/2 x

The above equation can be written in two variables as,

2y = 3x

3x – 2y = 0

3x – 2y + 0 = 0

Question 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.

Solution:

Let the cost of a fountain pen be y and cost of a ball pen be x.

According to the given statement,

x = y/2 − 5

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or 2x = y – 10

or 2x – y + 10 = 0

Which is required linear equation.

Exercise 13.2

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

(i) 3x + 4y = 7

(ii) x = 6y

(iii) x + πy = 4

(iv) 2/3x – y = 4.

Solution:

(i) 3x + 4y =7 ….(1)

Step 1: Isolate above equation in y.

Subtract 3x from both the sides,

3x + 4y – 3x = 7 – 3x

4y = 7 – 3x

Divide each side by 4

y = 1/4 x (7 – 3x) ….(2)

Step 2: Find Solutions

Substituting x = 1 in (2)

y = 1/4 x (7 – 3) = 1/4 x 4 = 1

Thus x = 1 and y = 1 is the solution of 3x + 4y = 7

Again, Substituting x = 2 in (2)

y = 1/4 x (7 – 3 x 2) = 1/4 x 1 = 1/4

Thus x = 2 and y = 1/4 is the solution of 3x + 4y = 7

Therefore, (1, 1) and (2, 1/4) are two solution of 3x + 4y = 7.

(ii) Given: x = 6y

Substituting x =0 in the given equation,

0 = 6y

or y = 0

Thus (0,0) is one solution

Again, substituting x=6

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6 = 6y

or y = 1

Thus, (6, 1) is another solution.

Therefore, (0, 0) and (6, 1) are two solutions of x = 6y.

(iii) Given: x + πy = 4

Substituting x = 0 ⇒ 0 + πy = 4 ⇒ y = 4/ π

Substituting y = 0 ⇒ x + 0 = 4 ⇒ x = 4

Therefore, (0, 4/ π) and (4, 0) are two solutions of x + πy = 4.

(iv) Given: 2/3 x – y = 4

Substituting x = 0 ⇒ 0 – y = 4 ⇒ y = -4

Substituting x = 3 ⇒ 2/3 × 3 – y = 4 ⇒ 2 – y = 4 ⇒ y = -2

Therefore, (0, -4) and (3, -2) are two solutions of 2/3 x – y = 4.

Question 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

Solution:

(i) Given: 5x – 2y = 10

Substituting x = 0 ⇒ 5 × 0 – 2y = 10 ⇒ – 2y = 10 ⇒ – y = 10/2 ⇒ y = – 5

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

Substituting y = 0 ⇒ 5x – 2 x 0 = 10 ⇒ 5x = 10 ⇒ x = 2

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

(ii) Given, – 4x + 3y = 12

Substituting x = 0 ⇒ -4 × 0 + 3y = 12 ⇒ 3y = 12 ⇒ y = 4

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

Substituting y = 0 ⇒ -4 x + 3 x 0 = 12 ⇒ – 4x = 12 ⇒ x = -3

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

(iii) Given, 2x + 3y = 24

Substituting x = 0 ⇒ 2 x 0 + 3y = 24 ⇒ 3y =24 ⇒ y = 8

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

Substituting y = 0 ⇒ 2x + 3 x 0 = 24 ⇒ 2x = 24 ⇒ x =12

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

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Question 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) (√3, 0) (v) (1/2 , -5)

Solution:

(i) Check for (3, 0)

Put x = 3 and y = 0 in equation 2x – y = 6

2(3) – (0) = 6

6 = 6

True statement.

⇒ (3,0) is a solution of 2x – y = 6.

(ii) Check for (0, 6)

Put x = 0 and y = 6 in 2x – y = 6

2 x 0 – 6 = 6

-6 = 6

False statement.

⇒ (0, 6) is not a solution of 2x – y = 6.

(iii) Check for (2, -2)

Put x = 0 and y = 6 in 2x – y = 6

2 x 2 – (-2) = 6

4 + 2 = 6

6 = 6

True statement.

⇒ (2,-2) is a solution of 2x – y = 6.

(iv) Check for (√3, 0)

Put x = √3 and y = 0 in 2x – y = 6

2 x √3 – 0 = 6

2 √3 = 6

False statement.

⇒(√3, 0) is not a solution of 2x – y = 6.

(v) Check for (1/2, -5)

Put x = 1/2 and y = -5 in 2x – y = 6

2 x (1/2) – (-5) = 6

1 + 5 = 6

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6 = 6

True statement.

⇒ (1/2, -5) is a solution of 2x – y = 6.

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

Solution:

Given, 3 x + 4 y = k

(-1, 2) is the solution of 3x + 4y = k, so it satisfy the equation.

Substituting x = -1 and y = 2 in 3x + 4y = k, we get

3 (– 1) + 4(2) = k

– 3 + 8 = k

k = 5

The value of k is 5.

Question 5: Find the value of λ, if x = –λ and y = 5/2 is a solution of the equation x + 4y – 7 = 0

Solution:

Given, (-λ, 5/2) is a solution of equation 3x + 4y = k

Substituting x = – λ and y = 5/2 in x + 4y – 7 = 0, we get

– λ + 4 (5/2) – 7 =0

-λ + 10 – 7 = 0

λ = 3

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

Solution:

Given, (2 α + 1, α – 1) is the solution of equation 2x – 3y + 5 = 0.

Substituting x = 2 α + 1 and y = α – 1 in 2x – 3y + 5 = 0, we get

2(2 α + 1) – 3(α – 1) + 5 = 0

4 α + 2 – 3 α + 3 + 5 = 0

α + 10 = 0

α = – 10

The value of α is -10.

Question 7: If x = 1 and y = 6 is a solution of the equation 8x – ay + a^2 = 0, find the values of a.

Solution:

Given, (1 , 6) is a solution of equation 8x – ay + a^2 = 0

Substituting x = 1 and y = 6 in 8x – ay + a^2 = 0, we get

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8 x 1 – a x 6 + a^2 = 0

⇒ a^2 – 6a + 8 = 0 (quadratic equation)

Using quadratic factorization

a^2 – 4a – 2a + 8 = 0

a(a – 4) – 2 (a – 4) = 0

(a – 2) (a – 4)= 0

a = 2, 4

Values of a are 2 and 4.

Exercise 13.3

Question 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) x/2 − y/3 = 2

(vii) (x−2)/3 = y – 3 (viii) 2y = -x +1

Solution:

(i) Given : x + y = 4

or y = 4 – x,

Find values of x and y:

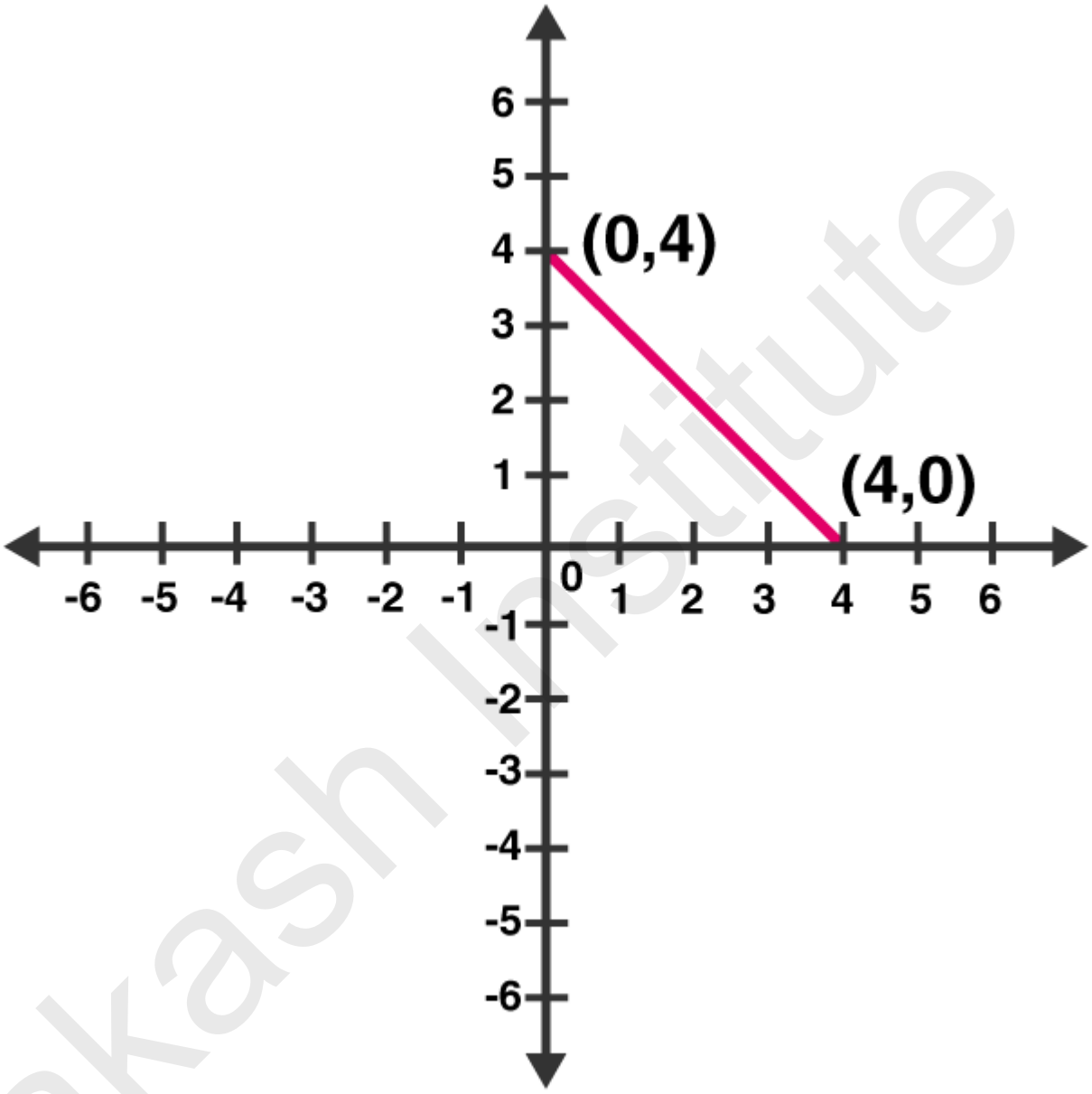
Putting x = 0 ⇒ y = 4

Putting x = 4 ⇒ y = 0

Graph:

Mark points (0, 4) and (4, 0) on the graph and join them.

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(ii) Given: x – y = 2

So, y = x – 2

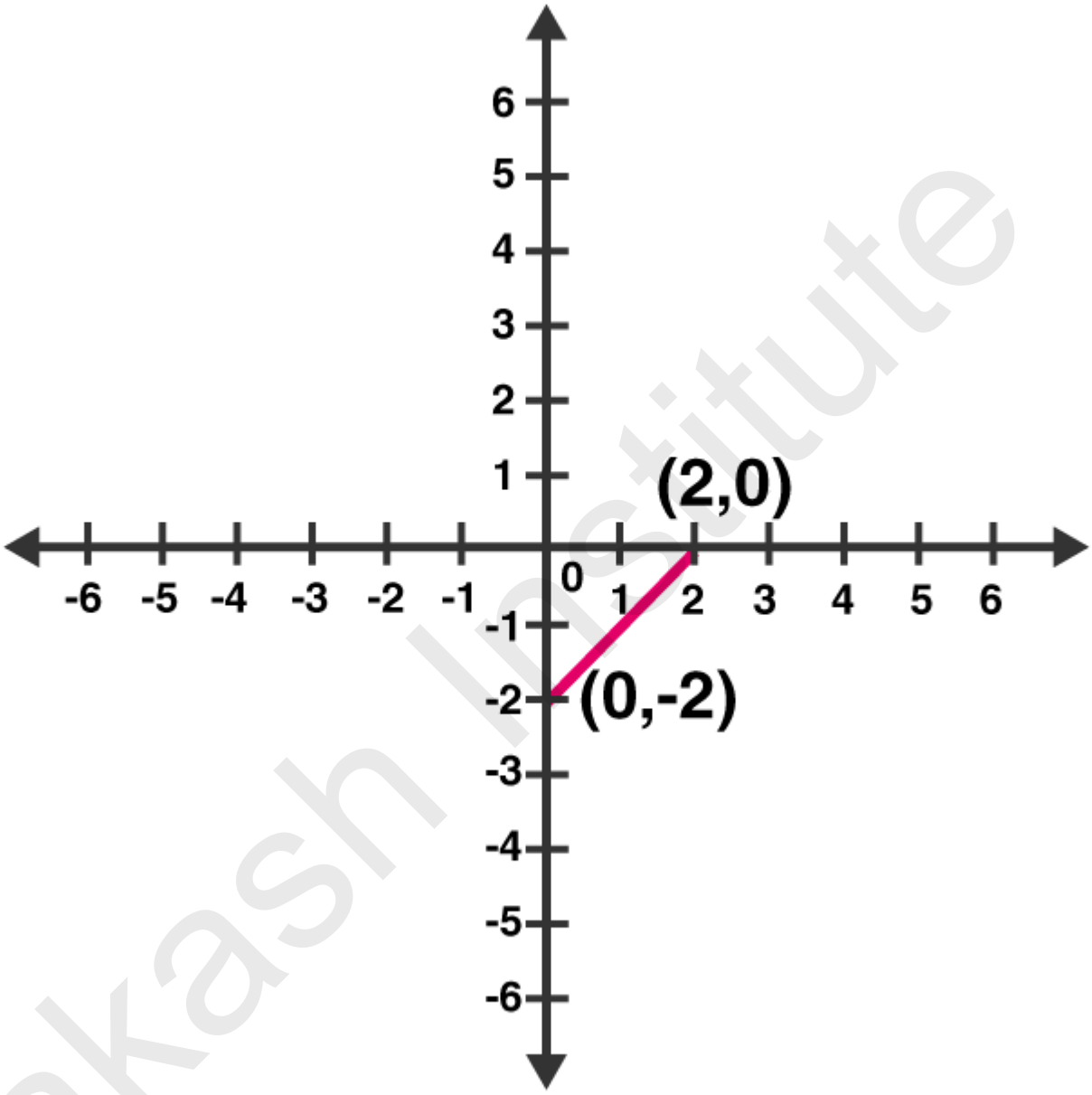
Putting x = 0 ⇒ y = – 2

Putting x = 2 ⇒ y = 0

Graph:

Mark points (0, -2) and (2, 0) on the graph and join them.

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(iii) Given: – x + y = 6

So, y = 6 + x

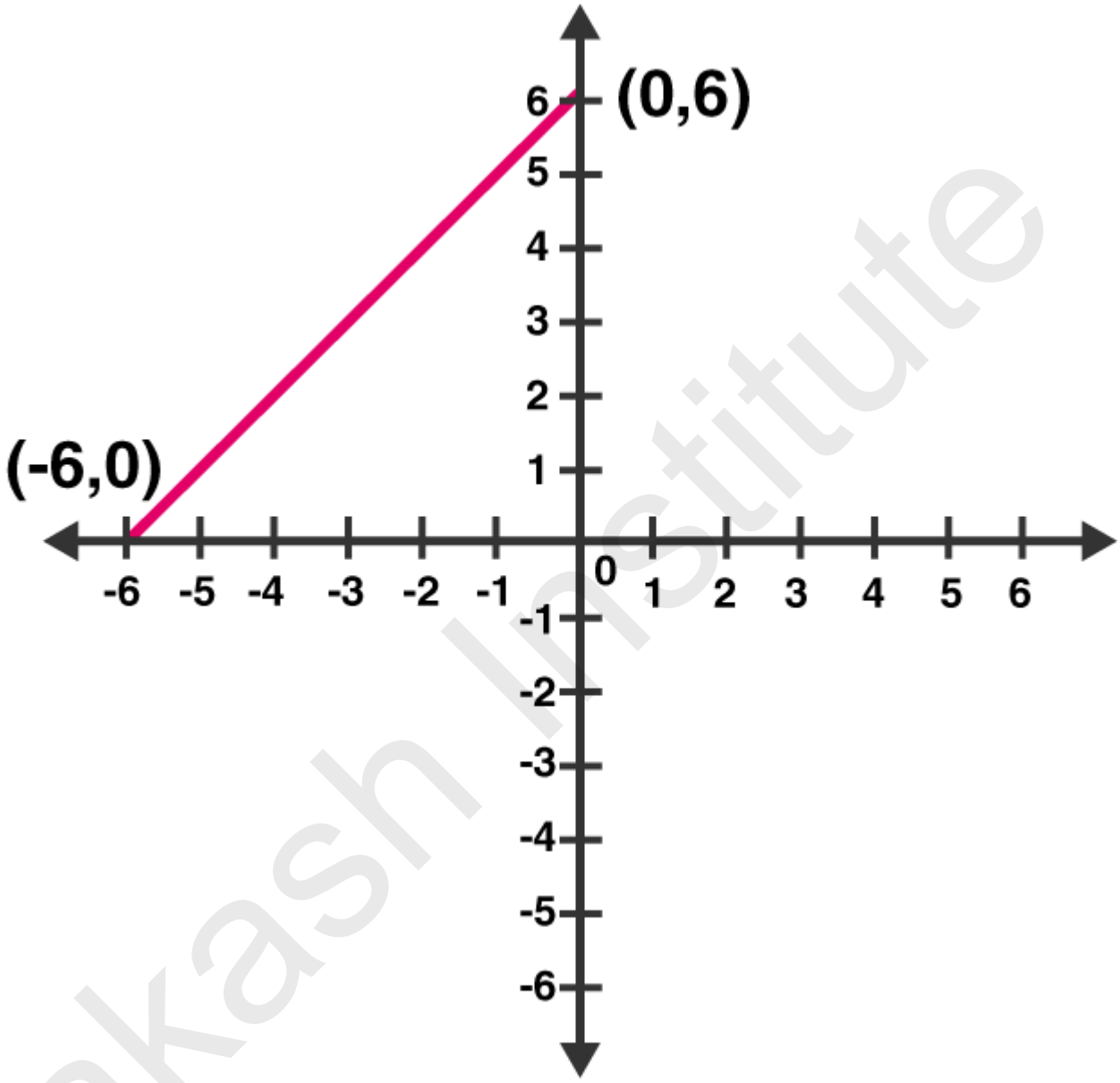
Putting x = 0 ⇒ y =6

Putting x = -6 ⇒ y = 0

Graph:

Mark points (0, 6) and (-6, 0) on the graph and join them.

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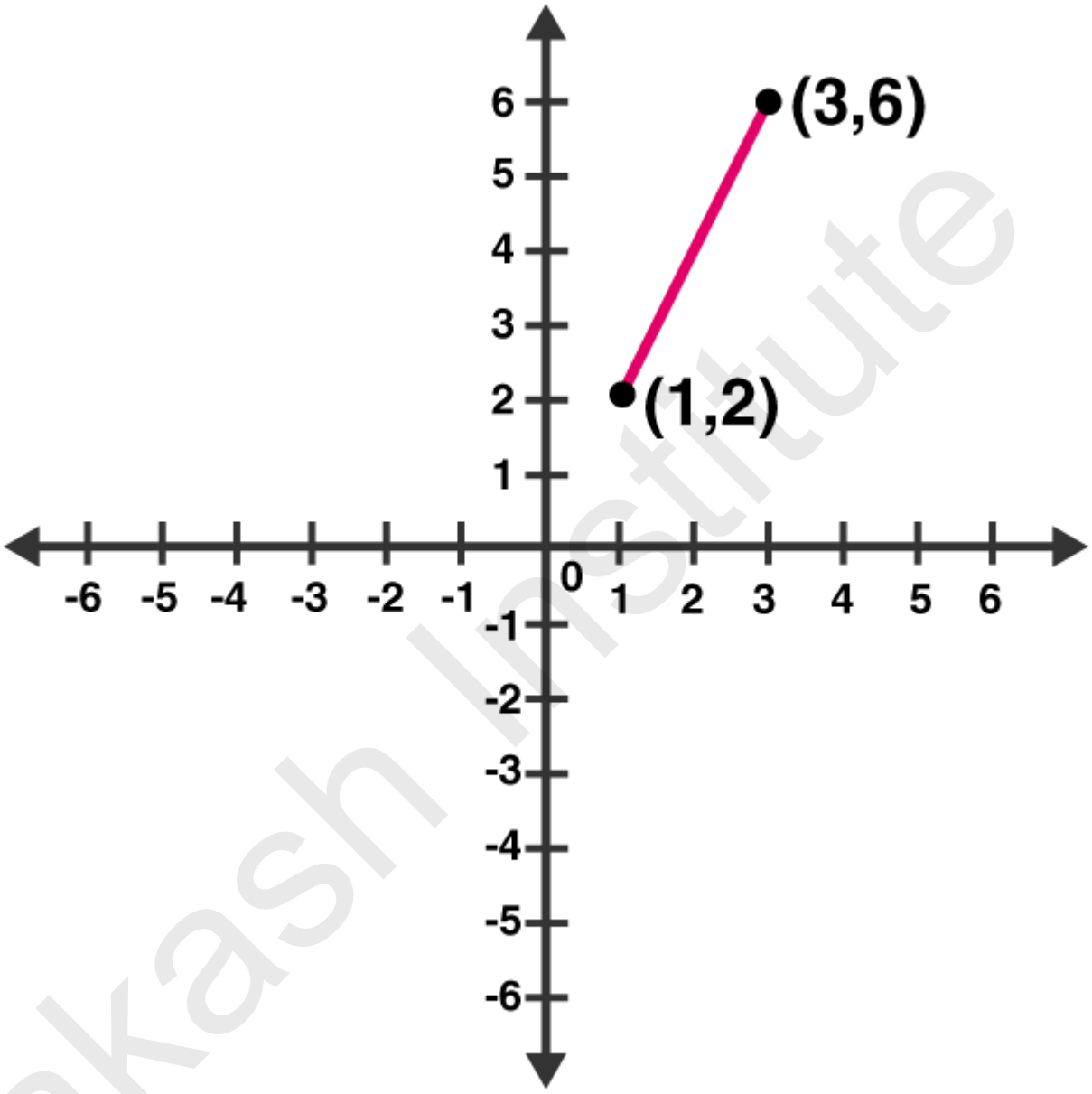
(iv) Given: $y = 2x$

Put $x = 1 \Rightarrow y = 2$

Put $x = 3 \Rightarrow y = 6$

Graph:

Mark points (1, 2) and (3, 6) on the graph and join them.



(v) Given: 3x + 5y = 15

Or 5y = 15 – 3x

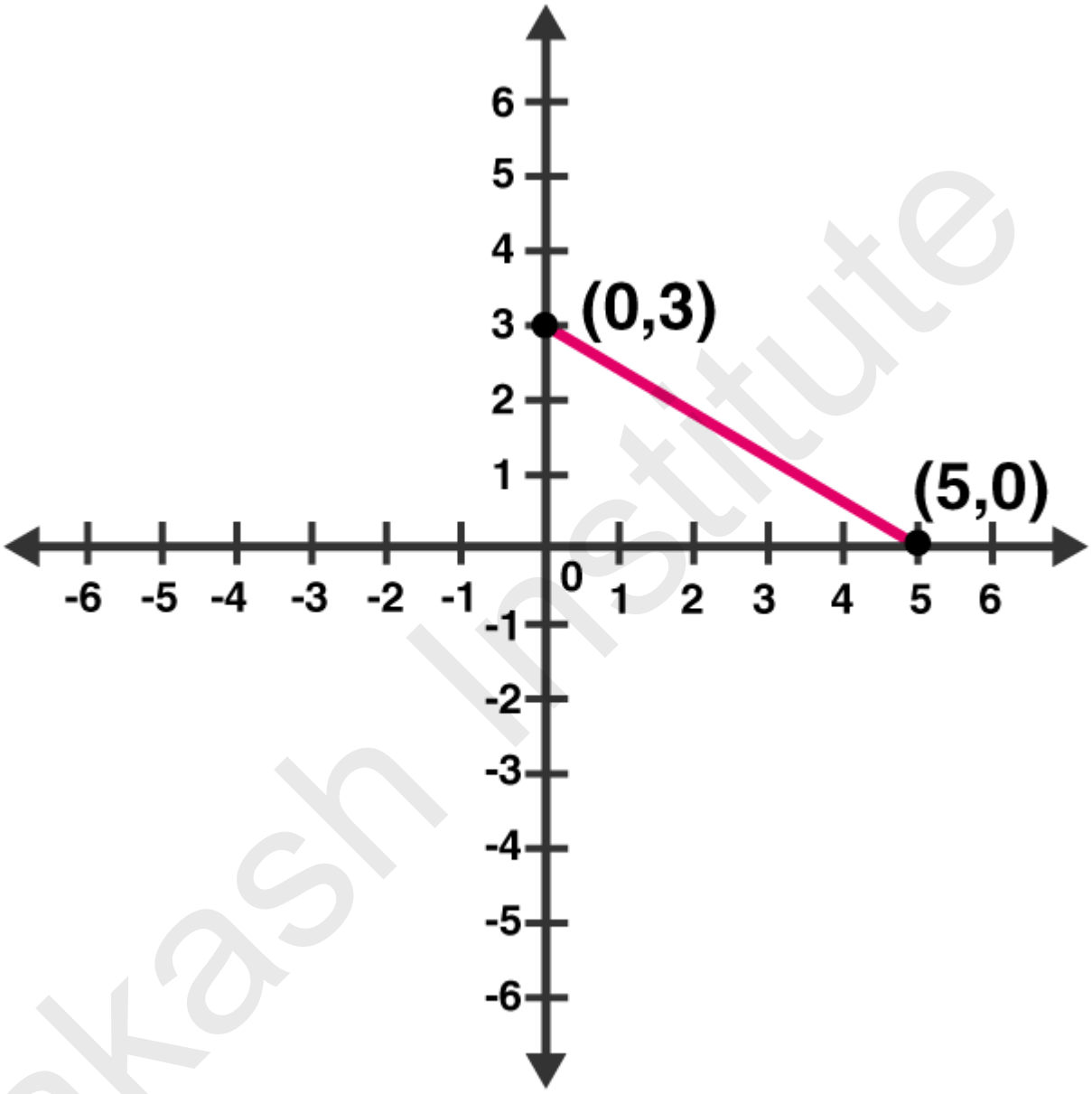
Putting x = 0 ⇒ 5y = 15 ⇒ y =3

Putting x = 5 ⇒ 5y = 0 ⇒ y = 0

Graph:

Mark points (0, 3) and (5, 0) on the graph and join them.

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(vi) Given: x/2 – y/3 = 2

3x – 2y = 12

y = (3x–12)/2

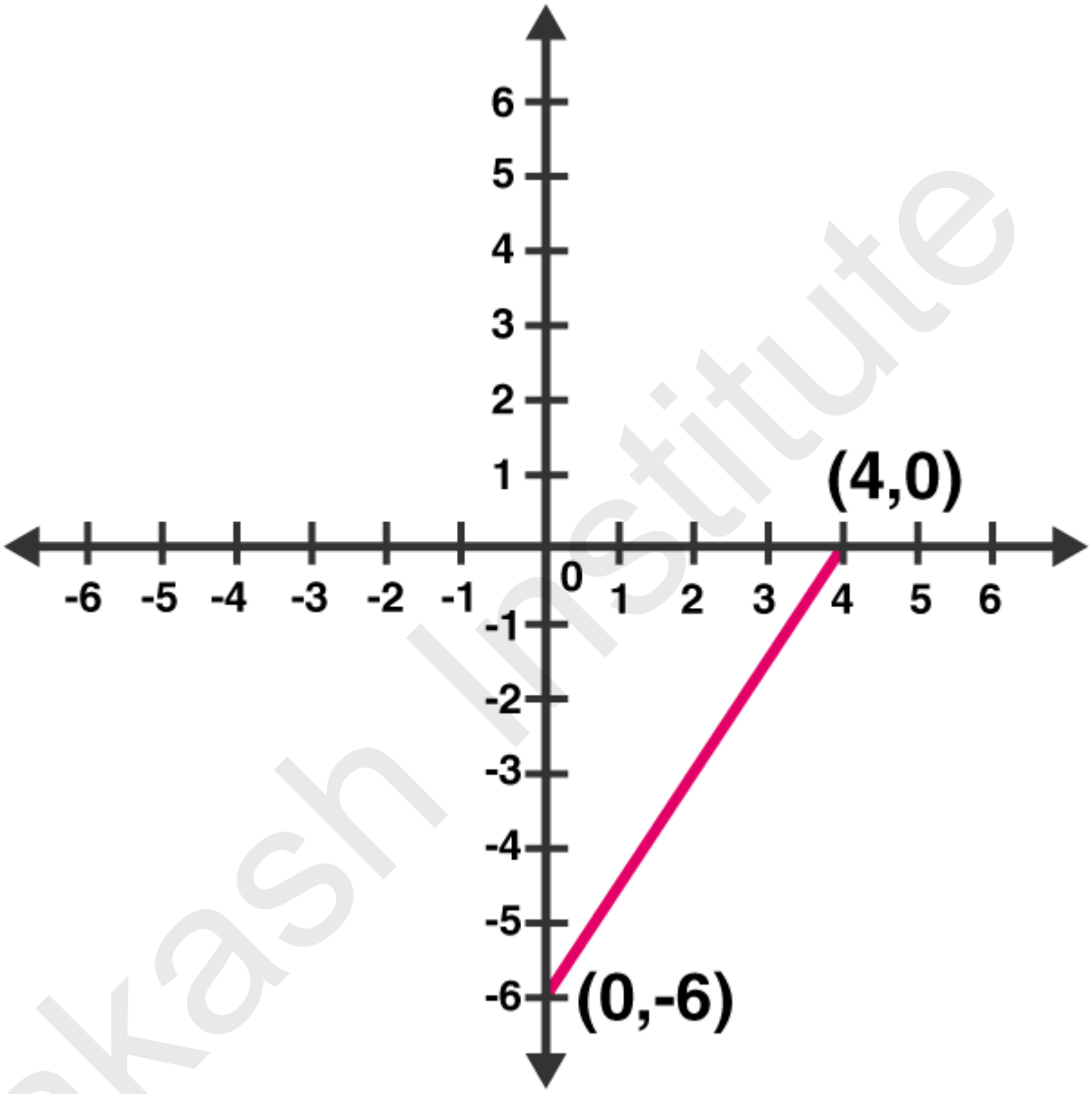
Putting x = 0 ⇒ y = -6

Putting x = 4 ⇒ y = 0

Graph:

Mark points (0, -6) and (4, 0) on the graph and join them.

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(vii) Given: (x −2)/3 = y − 3

x – 2 = 3(y – 3)

x – 2 = 3y – 9

x = 3y – 7

Now, put x = 5 in x = 3y – 7

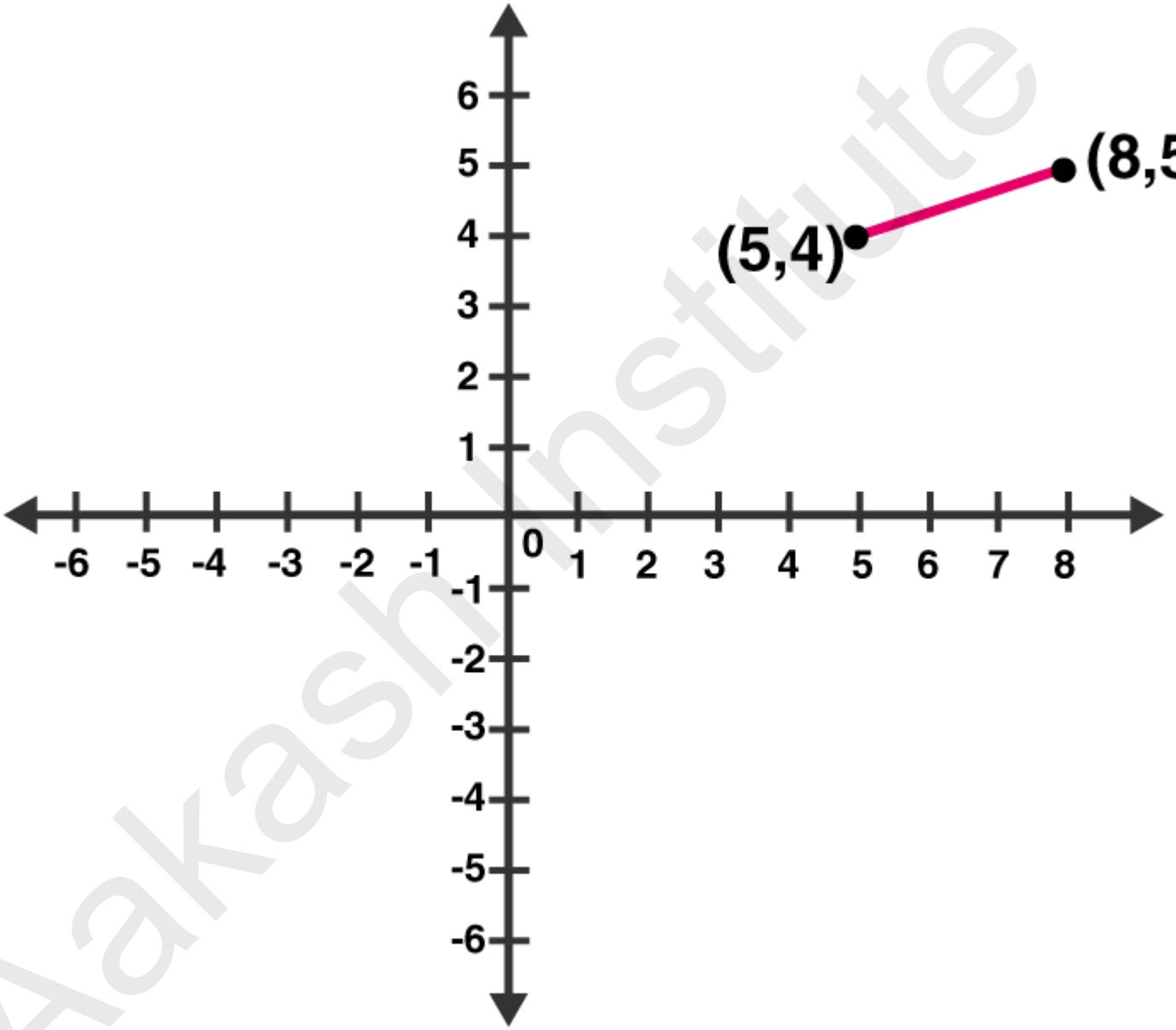
y = 4

Putting x = 8 in x = 3y – 7,

y = 5

Graph:

Mark points (5, 4) and (8, 5) on the graph and join them.



(viii) Given: 2y = – x +1

2y = 1 – x

Now, putting x = 1 in 2y = 1 – x, we get;

y = 0

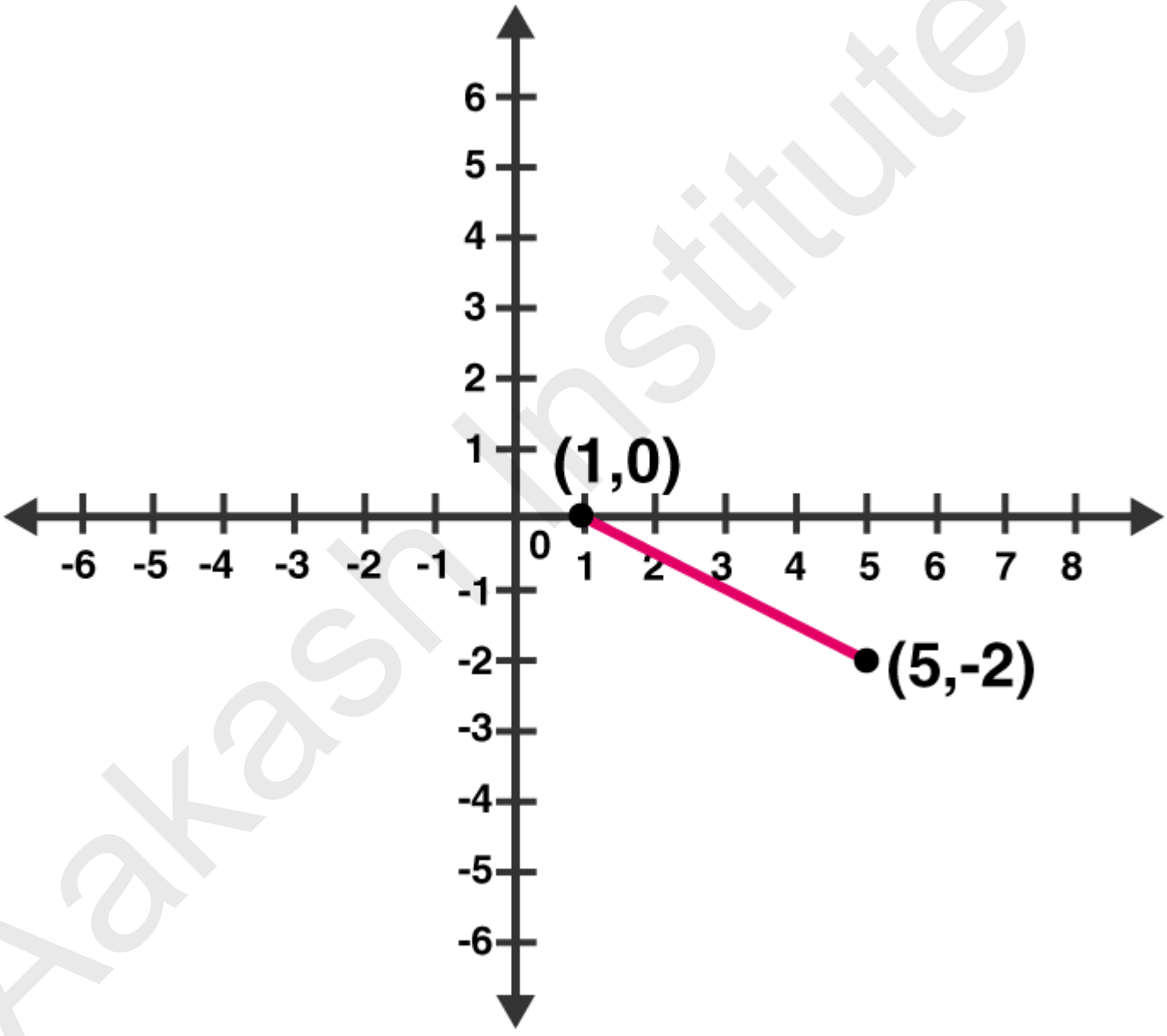
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Again, putting x = 5 in 2y = 1 – x, we get;

y = -2

Graph:

Mark points (1, 0) and (5, -2) on the graph and join them.



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

Solution:

Since a = 3 and b = 12 is the solution of required equations. So we have to find the set of any two equations which satisfy this point.

Consider 4a – b = 0 and 3a – b + 3 = 0 set of lines which are passing through (3, 12).

We know, infinite lines can be pass through a point.

So, there are infinite lines passing through (3, 12).

Question 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.

Solution:

Let, total fare for covering the distance of 'x' km is given by Rs y

As per the given statement;

$y = 15 + 8(x – 1)$

$y = 15 + 8x – 8$

$y = 8x + 7$

Above equation represents the linear equation for the given information.

Question 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.

Solution:

Aarushi paid Rs 27, of which Rs. x for the first three days and Rs. y per day for 4 more days is given by

$x + (7 – 3) y = 27$

$x + 4y = 27$

Above equation represents the linear equation for the given information.

Question 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 statement.

Solution:

Given: The original number is 27 more than the number obtained by reversing its digits

The given number is in the form of 10y + x.

Number produced by reversing the digits of the number is 10x + y.

As per statement:

$10y + x = 10x + y + 27$

$10y – y + x – 10x = 27$

$9y – 9x = 27$

$9 (y – x) = 27$

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$y - x = 3$

$x - y + 3 = 0$

Above equation represents the required linear equation.

Question 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.

Solution:

As per the statement given, the number is $10y + x$.

On reversing the digits of the number, we get, $10x + y$

Sum of the two numbers is 121. (Given)

$10y + x + 10x + y = 121$

$11x + 11y = 121$

$x + y = 11$

Which represents the required linear equation.

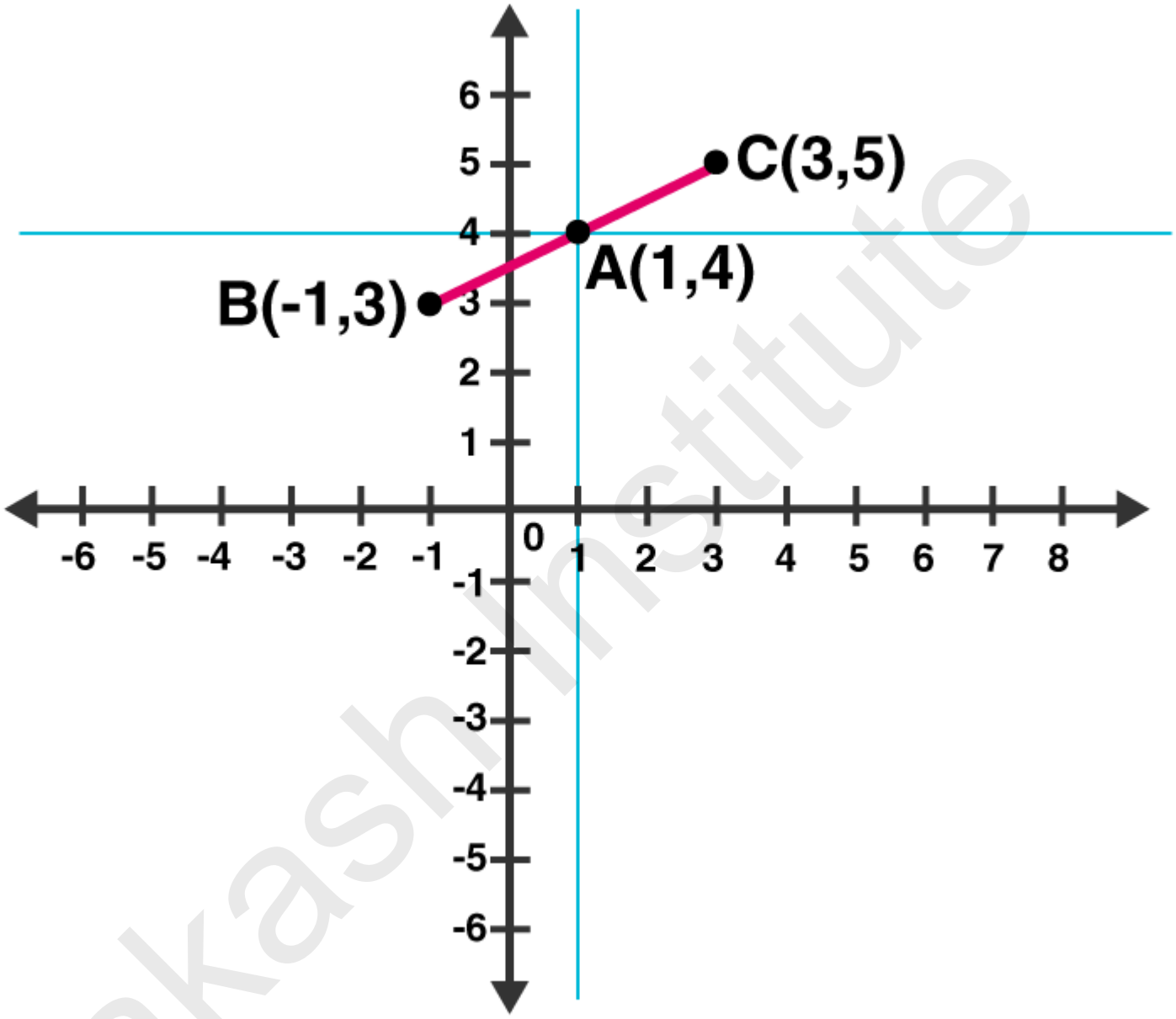
Question 7: Plot the Points (3, 5) and (-1, 3) on a graph paper and verify that the straight line passing through the points, also passes through the point (1, 4).

Solution:

Plot points (3, 5), (-1, 3) and (1, 4) on a graph.

Let A(1, 4), B(3, 5) and C(-1, 3)

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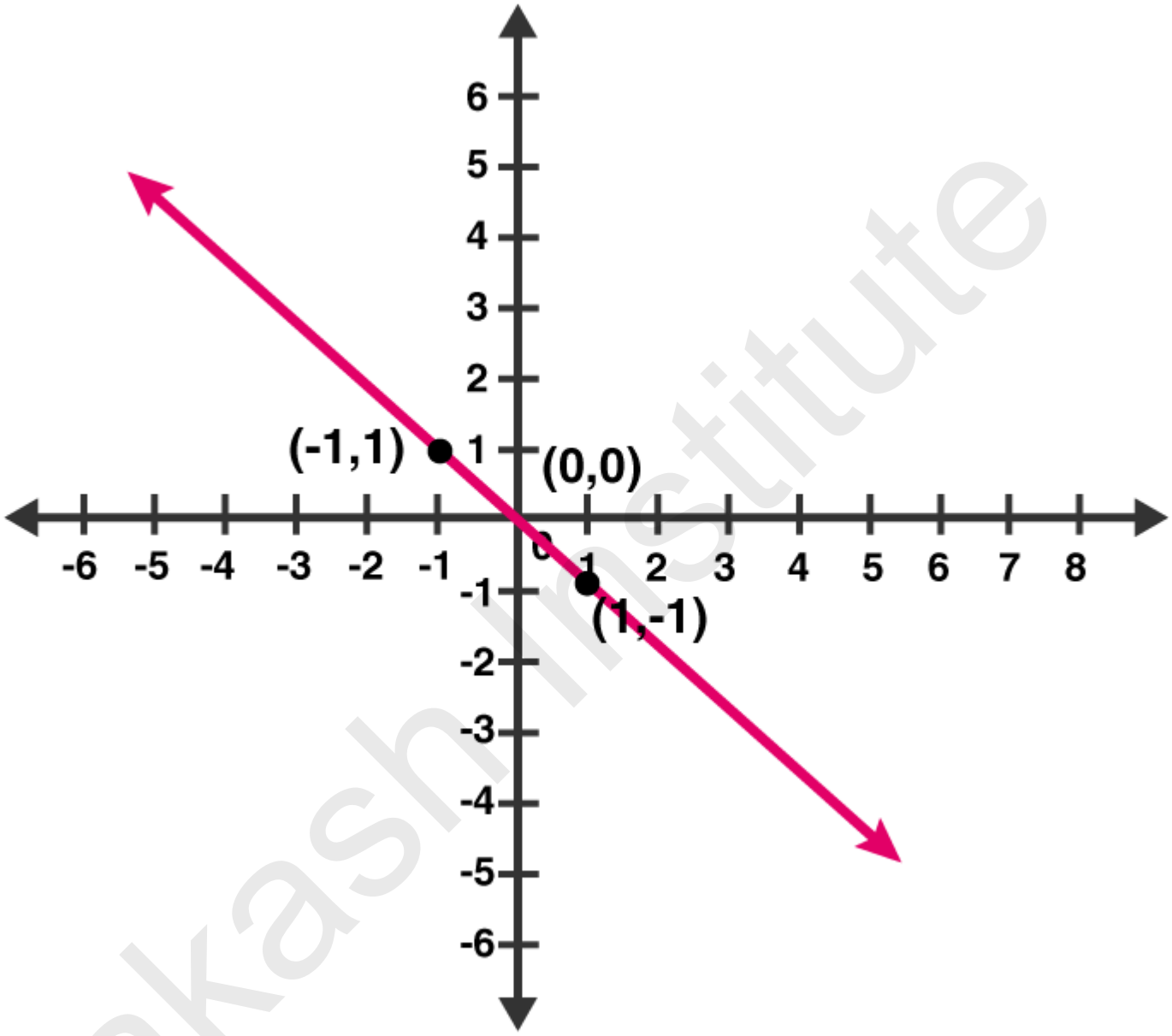
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From above graph, we can see that, Point A (1, 4) is already plotted on the graph, and a point of intersection of two intersecting lines.

Hence, it is proved that the straight line passing through (3, 5) and (-1, 3) and also passes through A (1, 4).

Question 8: From the choices given below, choose the equations whose graph is given in figure.

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



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Solution:

From graph, co-ordinates (1, -1) and (-1, 1) are solutions of one of the equations.

We will put the value of all the co-ordinates in each equation and check which equation satisfy them.

(i) $y = x$

Put $x = 1$ and $y = -1$,

Thus, $1 \neq -1$

L.H.S ≠ R.H.S

Putting x = -1 and y = 1 ,

$-1 \neq 1$

L.H.S ≠ R.H.S

Therefore, y = x does not represent the graph in the given figure.

(ii) x + y = 0

Putting x = 1 and y = -1 ,

$\Rightarrow 1 + (-1) = 0$

$\Rightarrow 0 = 0$

L.H.S = R.H.S

Putting x = -1 and y = 1 ,

$(-1) + 1 = 0$

$0 = 0$

L.H.S = R.H.S

Thus, the given solutions satisfy this equation.

(iii) y = 2x

Putting x = 1 and y = -1

-1 = 2 (Not True)

Putting x = -1 and y = 1

1 = -2 (Not True)

Thus, the given solutions does not satisfy this equation.

(iv) 2 + 3y = 7x

Putting x = 1 and y = -1

2 – 3 = 7

-1 = 7 (Not true)

Putting x = -1 and y = 1

2 + 3 = -7

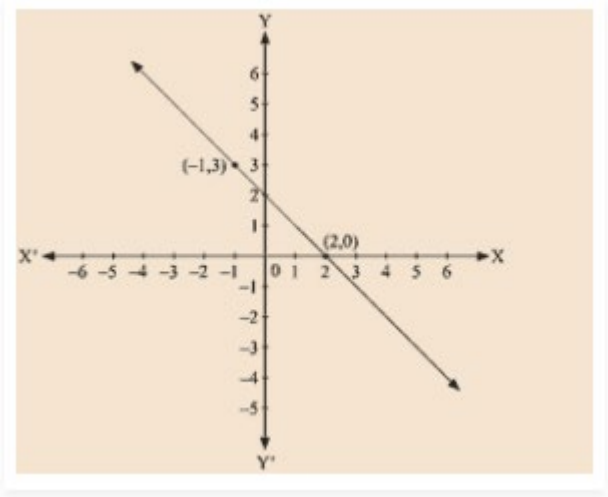
5 = -7 (Not True)

Thus, the given solutions does not satisfy this equation.

Question 9: From the choices given below, choose the equation whose graph is given fig:

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

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Solution:

Given: (-1, 3) and (2, 0) are the solution of one of the following given equations.

Check which equation satisfy both the points.

(i) $y = x + 2$

Putting, $x = -1$ and $y = 3$

$3 \neq -1 + 2$

L.H.S ≠ R.H.S

Putting, $x = 2$ and $y = 0$

$0 \neq 4$

L.H.S ≠ R.H.S

Thus, this solution does not satisfy the given equation.

(ii) $y = x - 2$

Putting, $x = -1$ and $y = 3$

$3 \neq -1 - 2$

L.H.S ≠ R.H.S

Putting, $x = 2$ and $y = 0$

$0 = 0$

L.H.S = R.H.S

Thus, the given solutions does not satisfy this equation completely.

(iii) $y = -x + 2$

Putting, $x = -1$ and $y = 3$

$3 = -(-1) + 2$

L.H.S = R.H.S

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Putting x = 2 and y = 0

0 = -2 + 2

0 = 0

L.H.S = R.H.S

Therefore, (0, 2) and (-1,3) satisfy this equation.

Hence, this is the graph for equation y = -x + 2 .

(iv) x + 2y = 6

Putting, x = – 1 and y = 3

-1 + 2(3) = 6

-1 + 6 = 6

5 = 6

L.H.S ≠ R.H.S

Putting x = 2 and y = 0

2 + 2(0) = 6

2 = 6

L.H.S ≠ R.H.S

Thus, this solution does not satisfy the given equation.

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

Solution:

Point (2,-2) lies on the given linear equation, which implies (2, -2) satisfy this equation 5x + ky = 4.

Now, putting x = 2 and y = -2 in 5x + ky = 4

5 × 2 + (-2) k = 4

10 – 2k = 4

2k = 10 – 4

2k = 6

k = 6/2 = 3

The value of k is 3.

Exercise 13.4

Question 1: Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

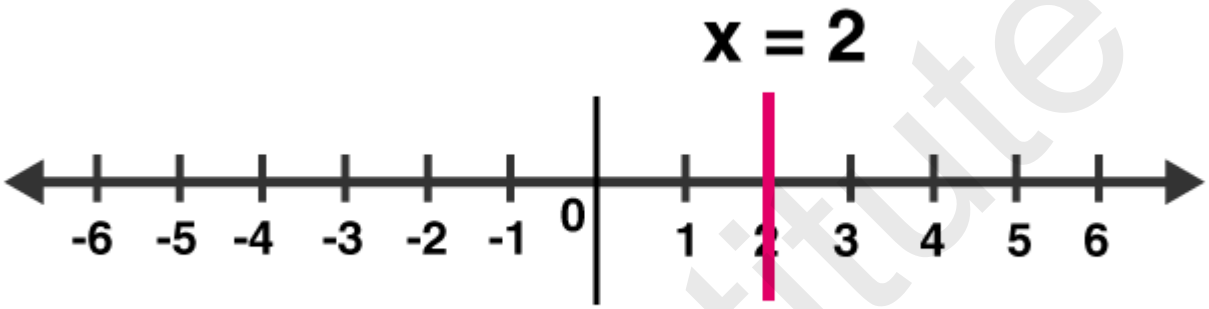
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(i) x = 2 (ii) y + 3 = 0 (iii) y = 3 (iv) 2x + 9 = 0 (v) 3x – 5 = 0

Solution:

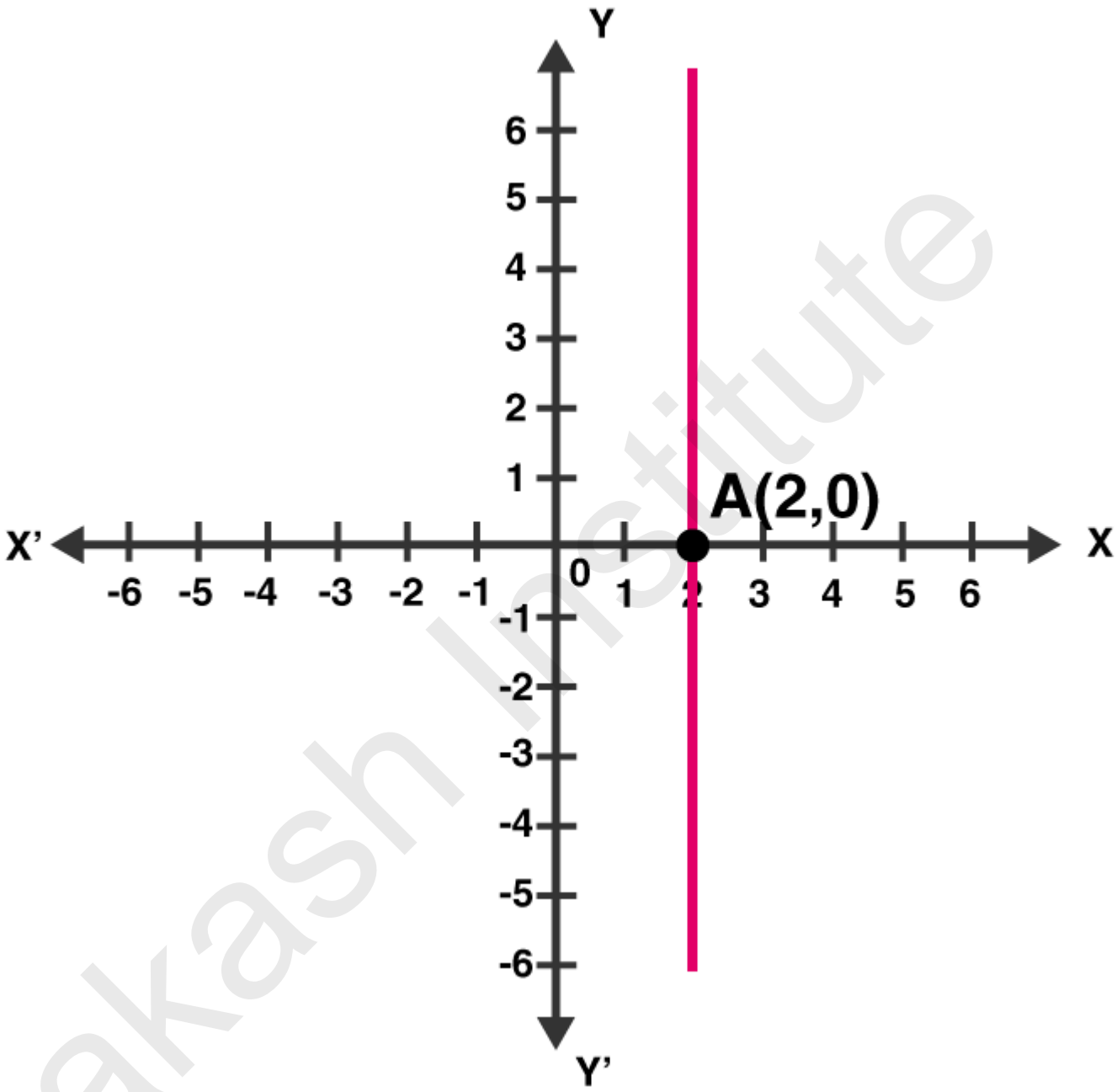
(i) x = 2

The representation of equation on the number line:



The representation of equation on the Cartesian plane:

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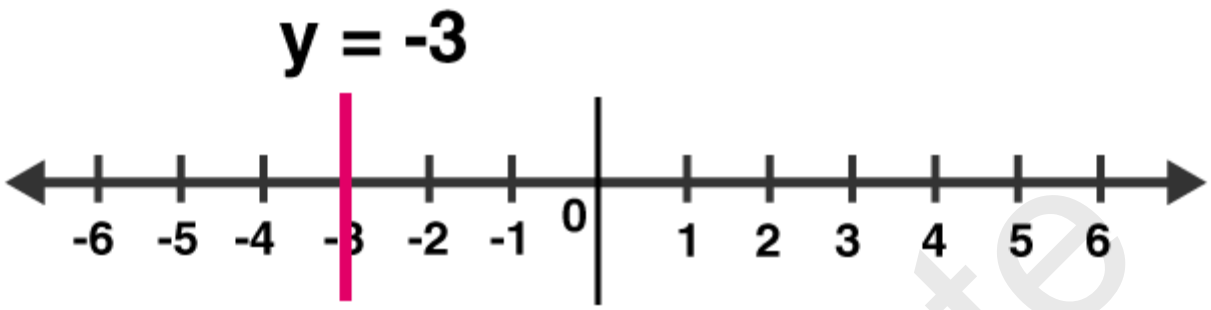


(ii) y + 3 = 0

or y = -3

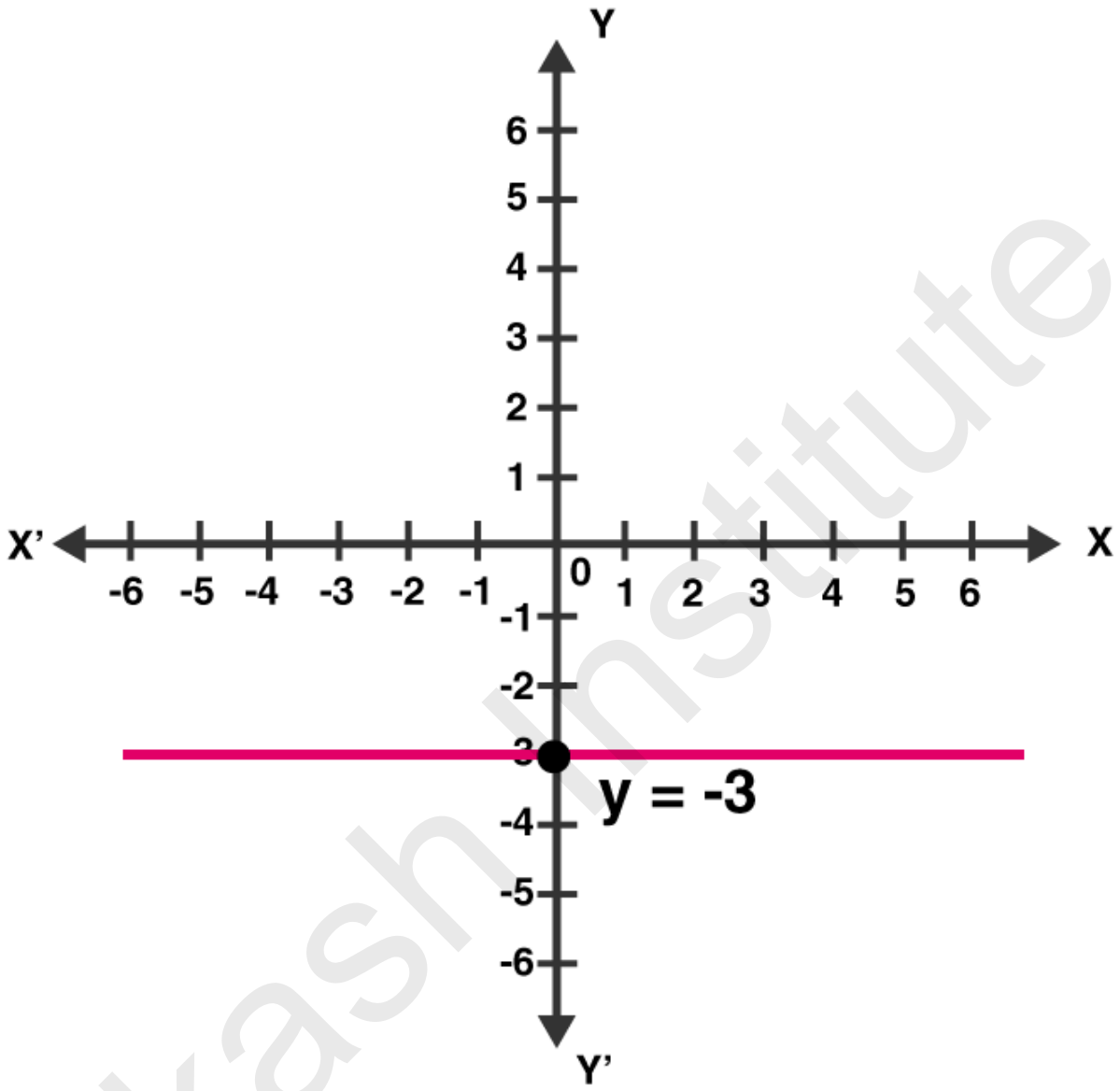
The representation of equation on the number line:

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The representation of equation on the Cartesian plane:

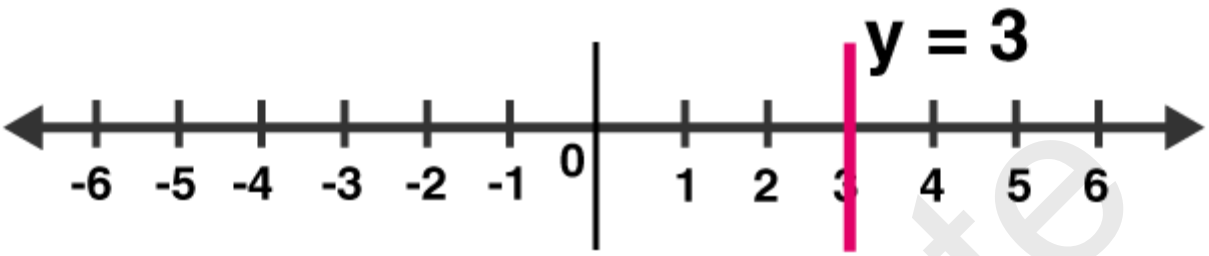
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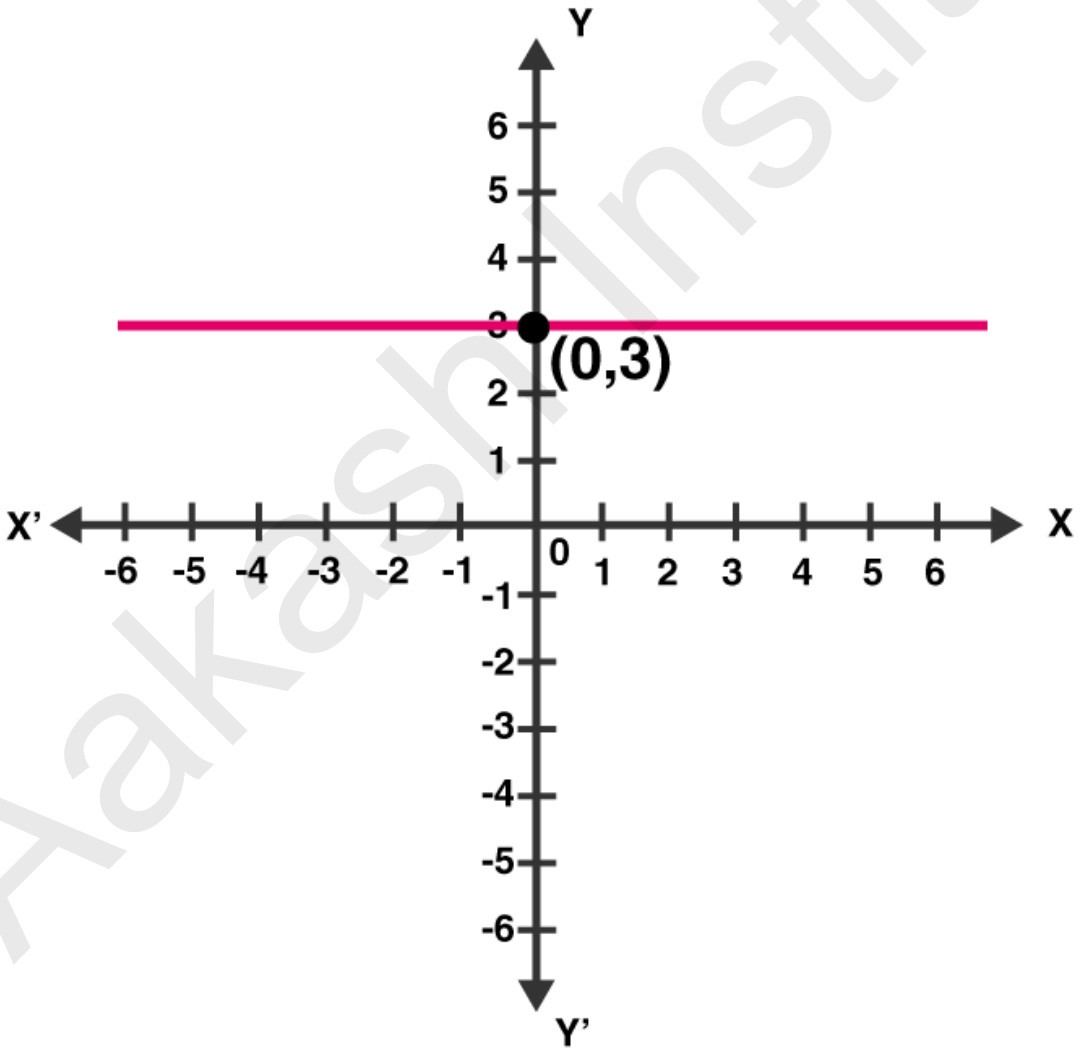
(iii) y = 3

The representation of equation on the number line:

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The representation of equation on the Cartesian plane:

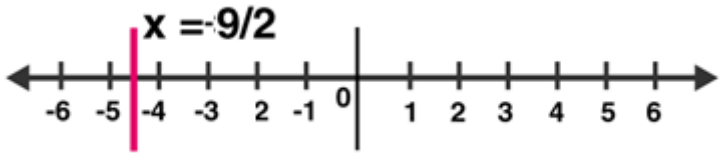


(iv) 2x + 9 = 0

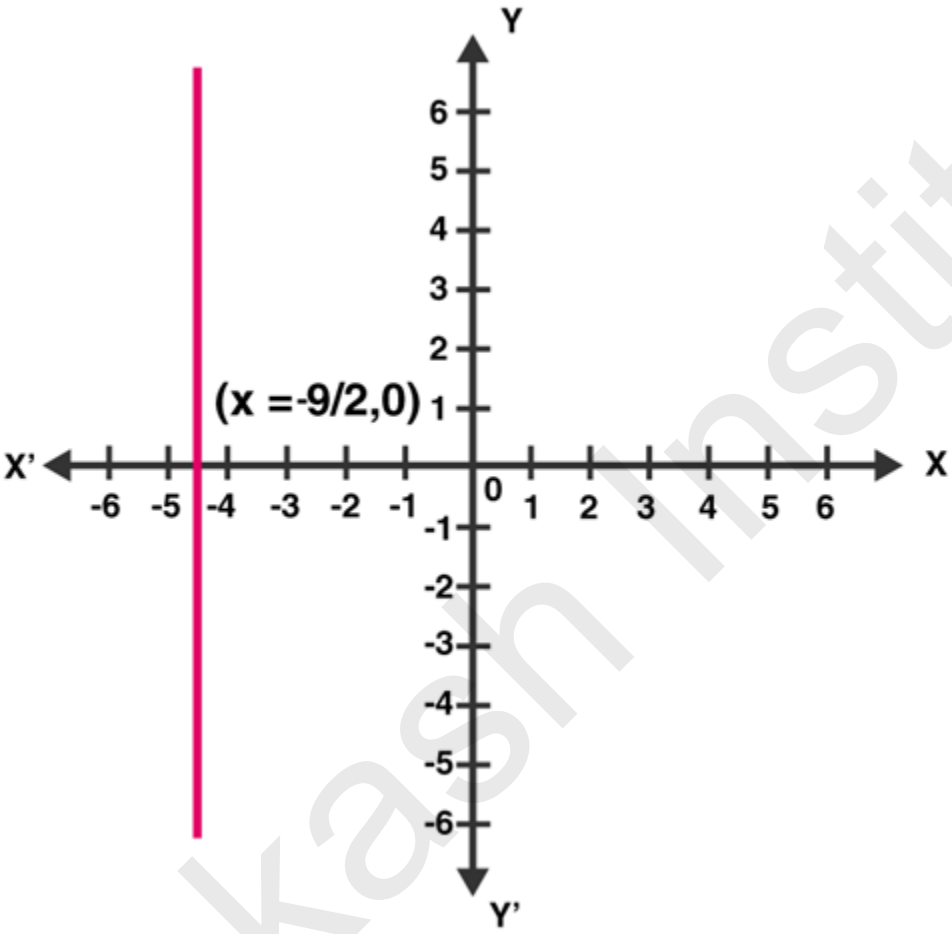
or x = -9/2

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The representation of equation on the number line:



The representation of equation on the Cartesian plane:

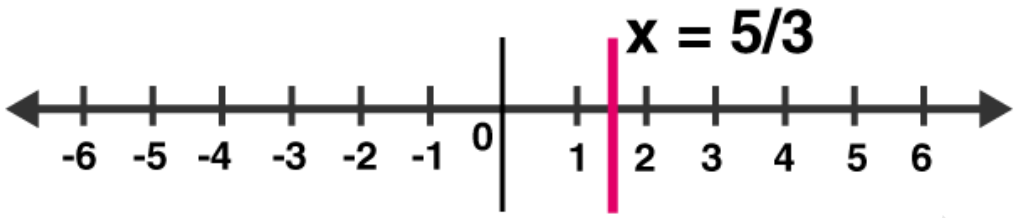


(v) 3x – 5 = 0

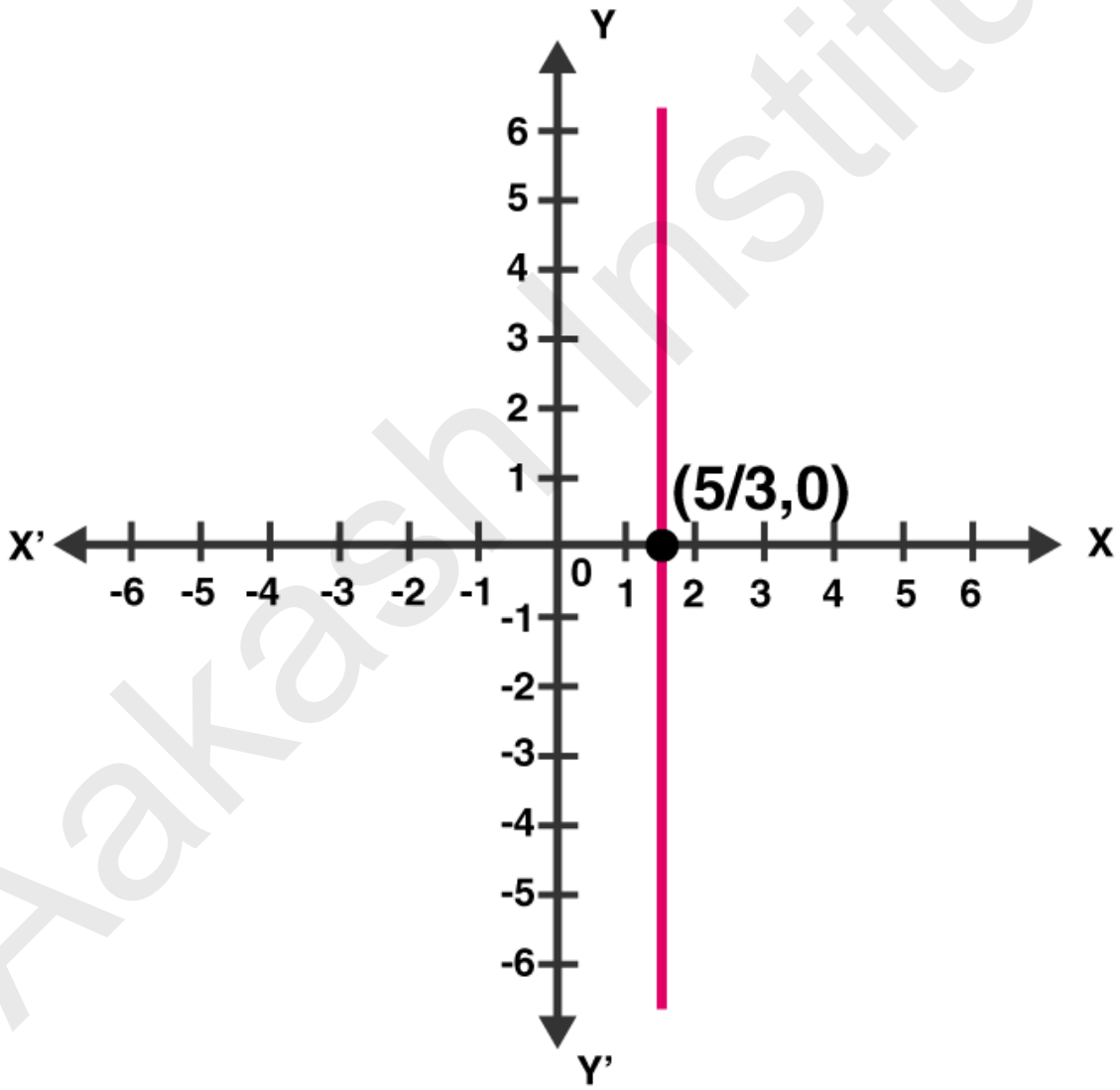
or x = 5/3

The representation of equation on the number line:

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The representation of equation on the Cartesian plane:



Question 2 : Give the geometrical representation of 2x + 13 = 0 as an equation in

(i) one variable (ii) two variables

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Solution:

2x + 13 = 0

(i) Isolate given equation in x

Subtract 13 from both the sides

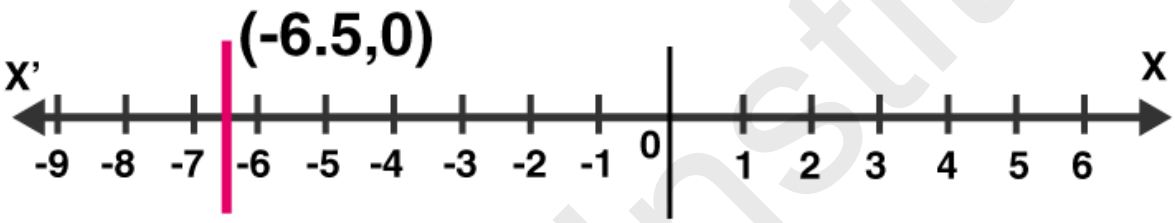
2x + 13 – 13 = 0 – 13

2x = -13

Divide each side by 2

x = -13/2 = -6.5

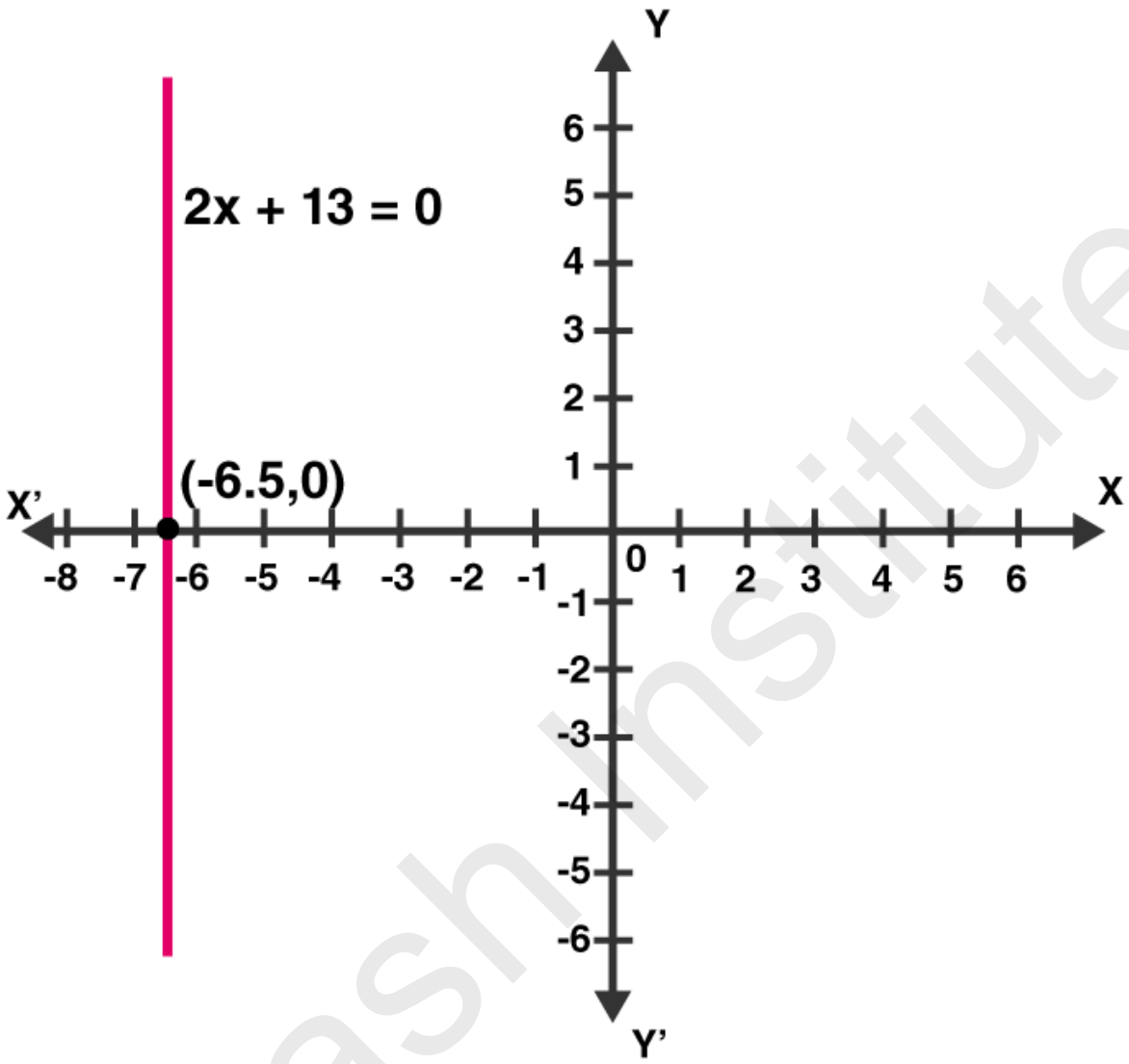
Which is an equation in one variable.



(ii) 2x + 13 = 0 can be written as 2x + 0y + 13 = 0

The representation of the solution on the Cartesian plane: A line parallel to y axis passing through the point (-13/2 , 0):

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Exercise VSAQs Page No: 13.32

Question 1: Write the equation representing x-axis.

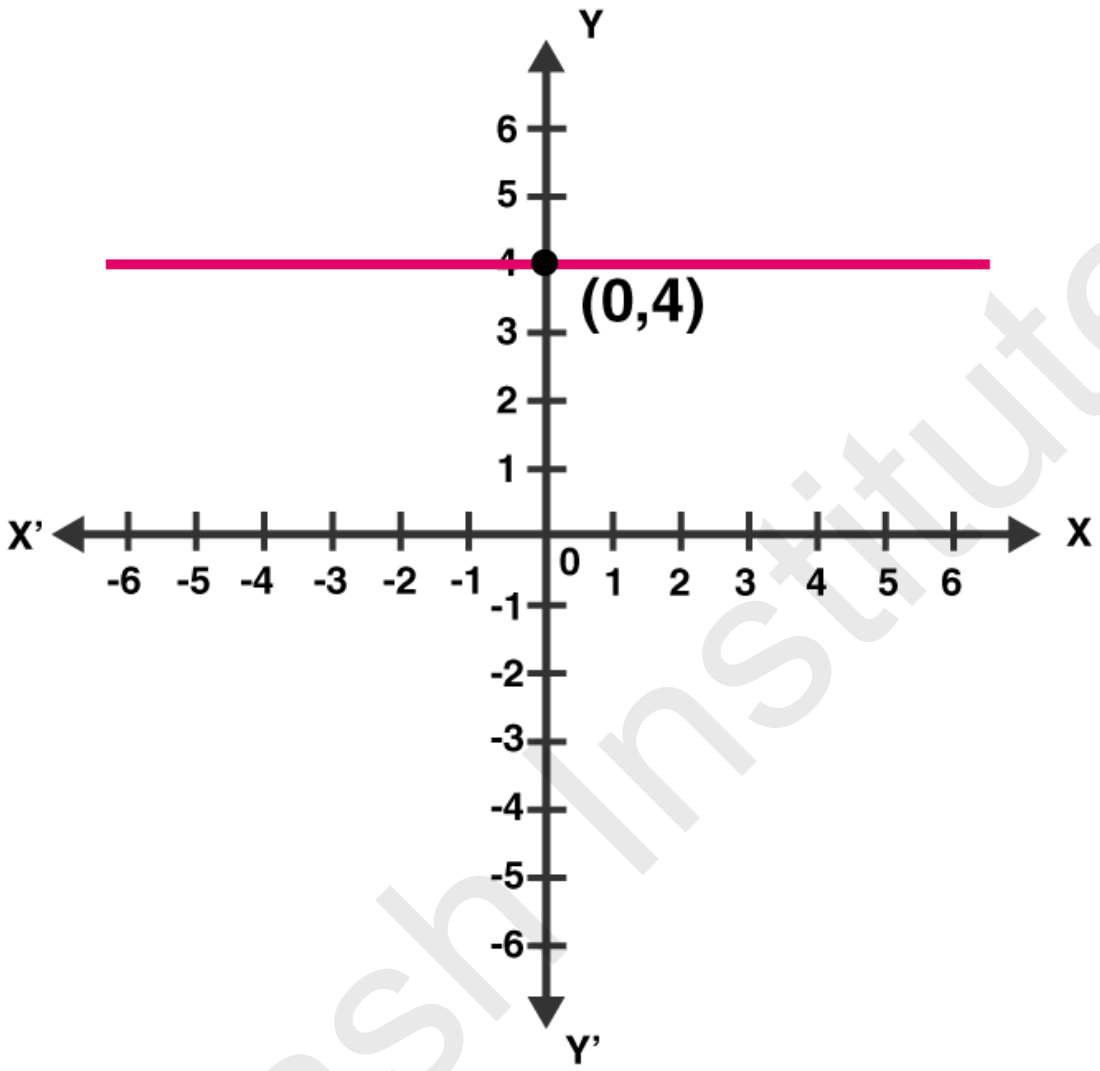
Solution: y = 0

Question 2: Write the equation representing y-axis.

Solution: x = 0

Question 3: Write the equation of a line passing through the point (0, 4) and parallel to x-axis.

Solution: Here, x-coordinate is zero and y-coordinate is 4, so equation of line passing through the point (0, 4) is **y = 4**.

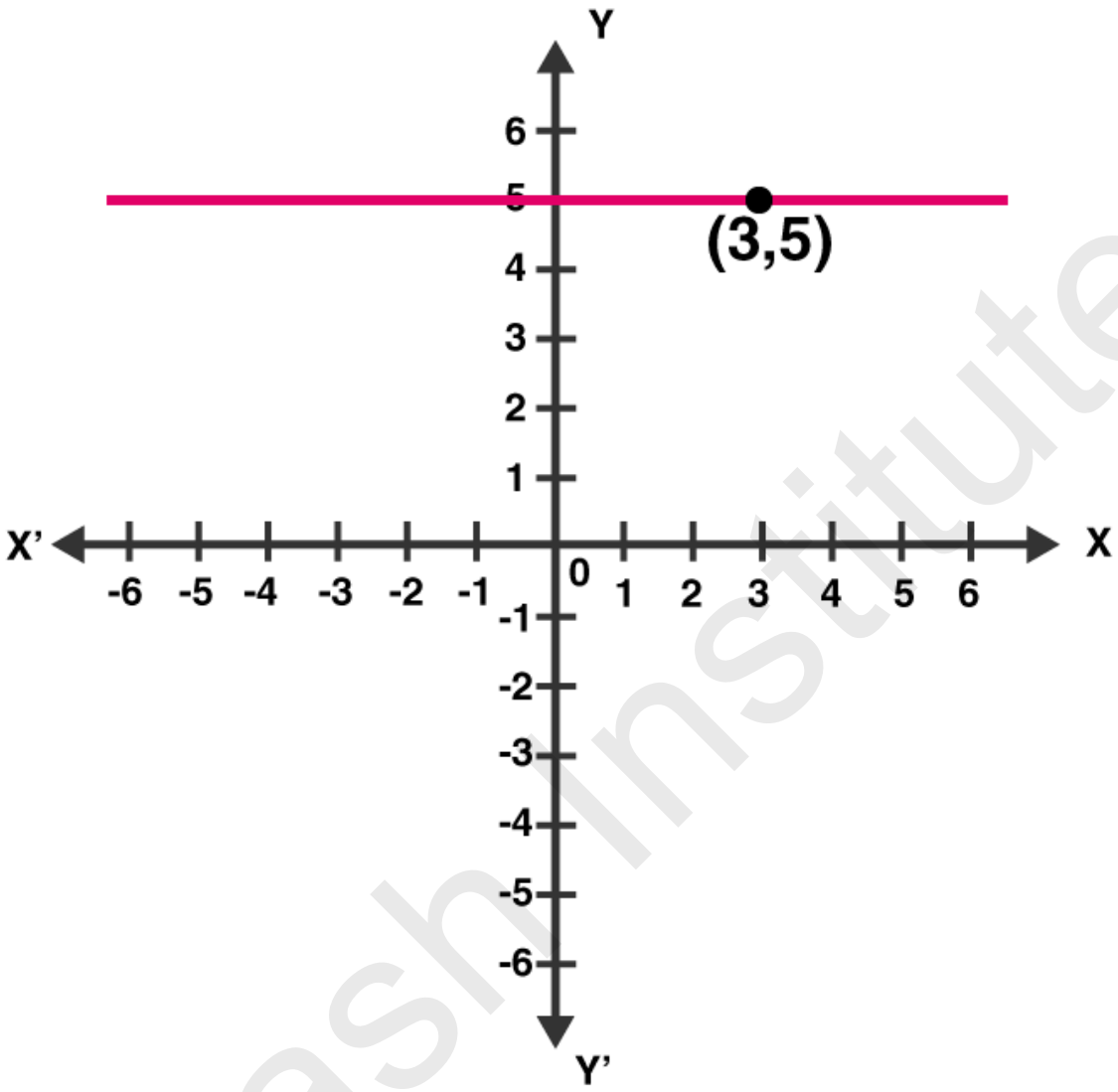


Question 4: Write the equation of a line passing through the point (3, 5) and parallel to x-axis.

Solution: Here x-coordinate = 3 and y-coordinate = 5

Since required line is parallel to x-axis, so equation of line is **y = 5**.

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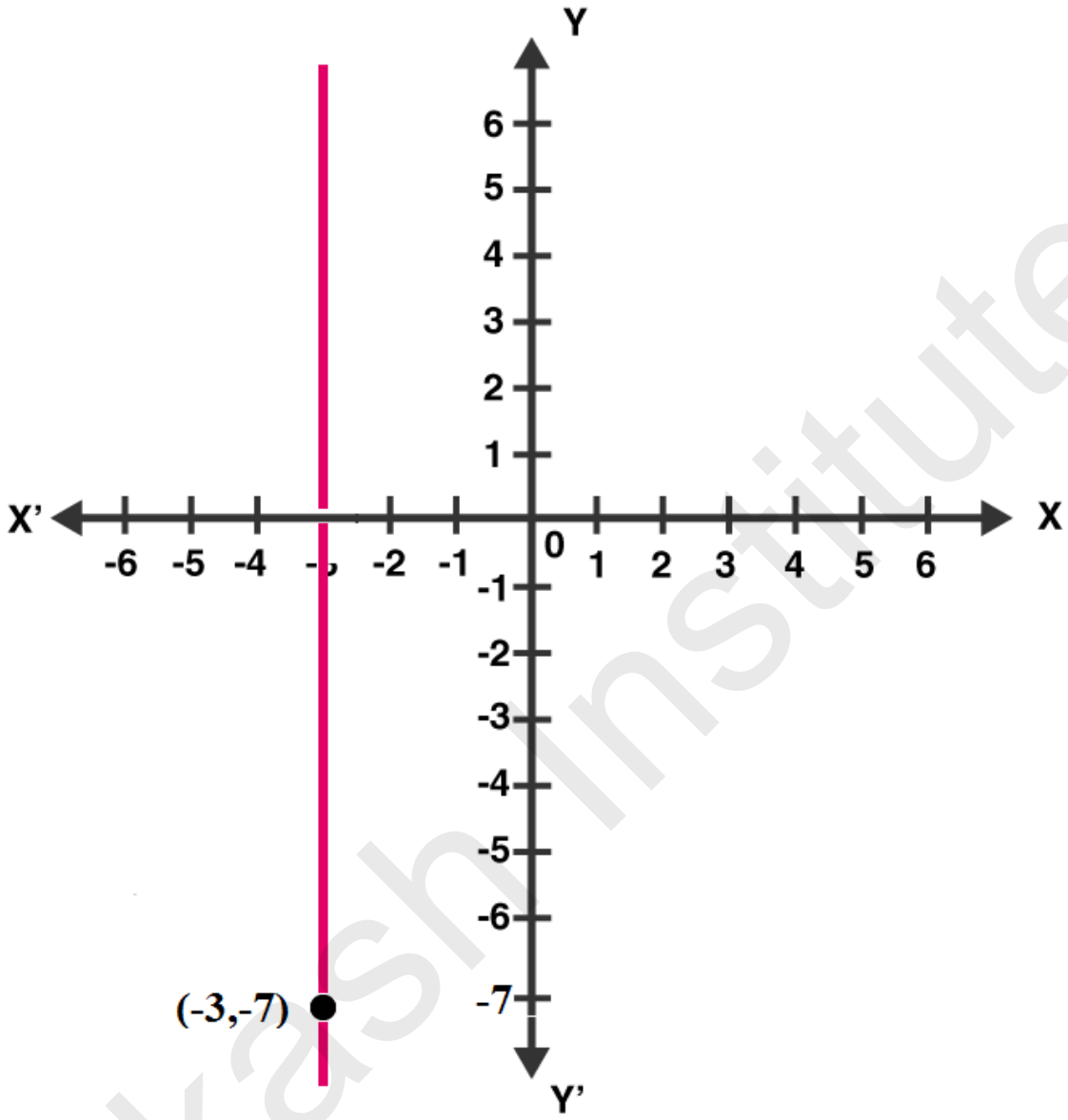
Question 5: Write the equation of a line parallel to y-axis and passing through the point (-3, -7)

Solution:

Here x-coordinate = -3 and y-coordinate = -7

Since required line is parallel to y-axis, so equation of line is **x = -3**.

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