

R D Sharma Solutions For Class 10 Maths Chapter 3- Pair of Linear Equations in Two Variables

Exercise 3.2

Solve the following system of equations graphically:

1. $x + y = 3$

$2x + 5y = 12$

Solution:

Given,

$x + y = 3$ (i)

$2x + 5y = 12$ (ii)

For equation (i),

When $y = 0$, we have $x = 3$

When $x = 0$, we have $y = 3$

Thus we have the following table giving points on the line $x + y = 3$

x	0	3
y	3	0

For equation (ii),

We solve for y:

$\Rightarrow y = (12 - 2x)/5$

So, when $x = 1$

$y = (12 - 2(1))/5 = 2$

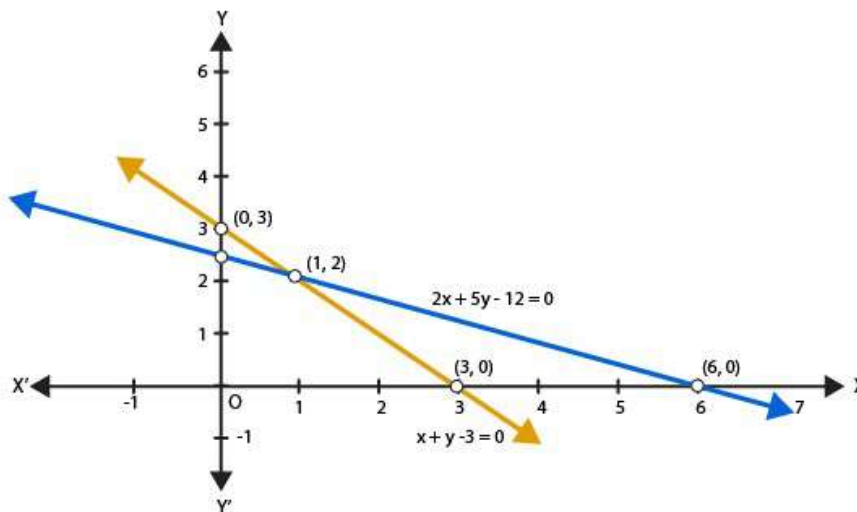
And, when $x = 6$

$\Rightarrow y = (12 - 2(6))/5 = 0$

Thus we have the following table giving points on the line $2x + 5y = 12$

x	1	6
y	2	0

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (1, 2)
Hence, $x = 1$ and $y = 2$

2. $x - 2y = 5$
 $2x + 3y = 10$
Solution:

Given,
 $x - 2y = 5$ (i)
 $2x + 3y = 10$ (ii)

For equation (i),

$$\Rightarrow y = (x - 5)/2$$

When $y = 0$, we have $x = 5$

When $x = 1$, we have $y = -2$

Thus we have the following table giving points on the line $x - 2y = 5$

x	5	1
y	0	-2

For equation (ii),

We solve for y:

$$\Rightarrow y = (10 - 2x)/3$$

So, when $x = 5$

$$y = (10 - 2(5))/3 = 0$$

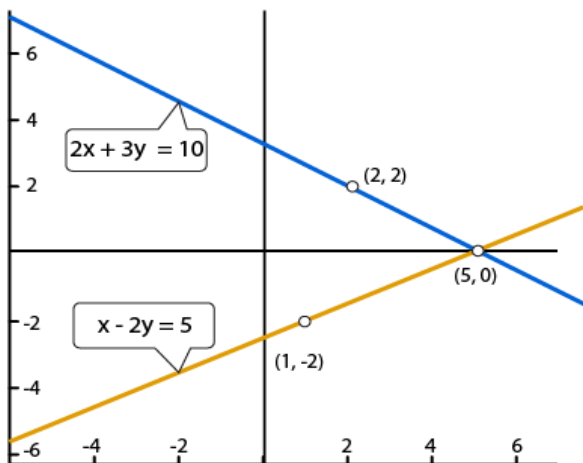
And, when $x = 2$

$$\Rightarrow y = (10 - 2(2))/3 = 2$$

Thus we have the following table giving points on the line $2x + 3y = 10$

x	5	2
y	0	2

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (5, 0)

Hence, $x = 5$ and $y = 0$

3. $3x + y + 1 = 0$

$2x - 3y + 8 = 0$

Solution:

Given,

$3x + y + 1 = 0$ (i)

$2x - 3y + 8 = 0$ (ii)

For equation (i),

$\Rightarrow y = -(1 + 3x)$

When $x = 0$, we have $y = -1$

When $x = -1$, we have $y = 2$

Thus we have the following table giving points on the line $3x + y + 1 = 0$

x	-1	0
y	2	-1

For equation (ii),

We solve for y:

$\Rightarrow y = (2x + 8)/3$

So, when $x = -4$

$y = (2(-4) + 8)/3 = 0$

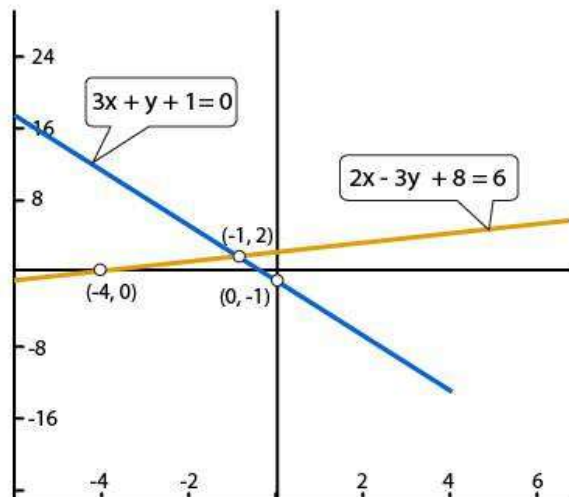
And, when $x = -1$

$\Rightarrow y = (2(-1) + 8)/3 = 2$

Thus we have the following table giving points on the line $2x - 3y + 8 = 0$

x	-4	-1
y	0	2

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (-1, 2)
Hence, $x = -4$ and $y = 0$

4. $2x + y - 3 = 0$
 $2x - 3y - 7 = 0$
Solution:

Given,
 $2x + y - 3 = 0$ (i)
 $2x - 3y - 7 = 0$ (ii)

For equation (i),

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

When $x = 0$, we have $y = (3 - 2(0)) = 3$

When $x = 1$, we have $y = (3 - 2(1)) = 1$

Thus we have the following table giving points on the line $2x + y - 3 = 0$

x	0	1
y	3	1

For equation (ii),

We solve for y:

$$\Rightarrow y = (2x - 7)/3$$

So, when $x = 2$

$$y = (2(2) - 7)/3 = -1$$

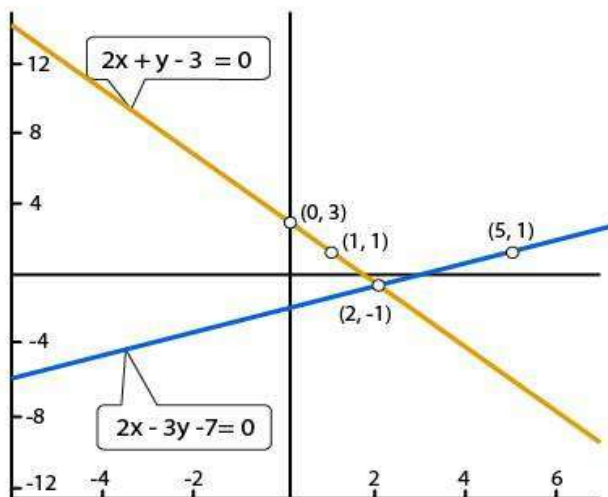
And, when $x = 5$

$$\Rightarrow y = (2(5) - 7)/3 = 1$$

Thus we have the following table giving points on the line $2x - 3y - 7 = 0$

x	2	5
y	-1	1

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (2, -1)

Hence, $x = 2$ and $y = -1$

5. $x + y = 6$

$x - y = 2$

Solution:

Given,

$x + y = 6$ (i)

$x - y = 2$ (ii)

For equation (i),

$\Rightarrow y = (6 - x)$

When $x = 2$, we have $y = (6 - 2) = 4$

When $x = 3$, we have $y = (6 - 3) = 3$

Thus we have the following table giving points on the line $x + y = 6$

x	2	3
y	4	3

For equation (ii),

We solve for y:

$\Rightarrow y = (x - 2)$

So, when $x = 2$

$y = (2 - 2) = 0$

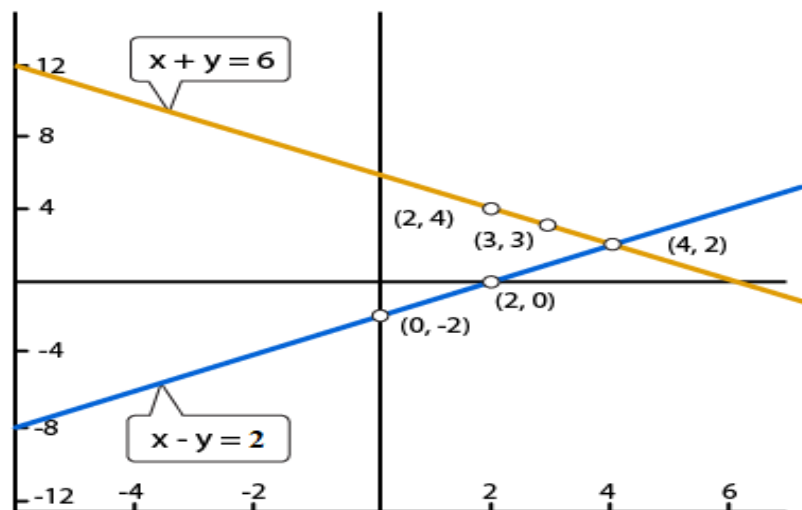
And, when $x = 4$

$y = (4 - 2) = 2$

Thus we have the following table giving points on the line $x - y = 2$

x	0	2
y	-2	0

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (4, 2)

Hence, $x = 4$ and $y = 2$

6. $x - 2y = 6$

$3x - 6y = 0$

Solution:

Given,

$x - 2y = 6$ (i)

$3x - 6y = 0$ (ii)

For equation (i),

$\Rightarrow y = (x - 6)/2$

When $x = 2$, we have $y = (2 - 6)/2 = -2$

When $x = 0$, we have $y = (0 - 6)/2 = -3$

Thus we have the following table giving points on the line $x - 2y = 6$

x	2	0
y	-2	-3

For equation (ii),

We solve for y:

$\Rightarrow y = x/2$

So, when $x = 0$

$y = 0/2 = 0$

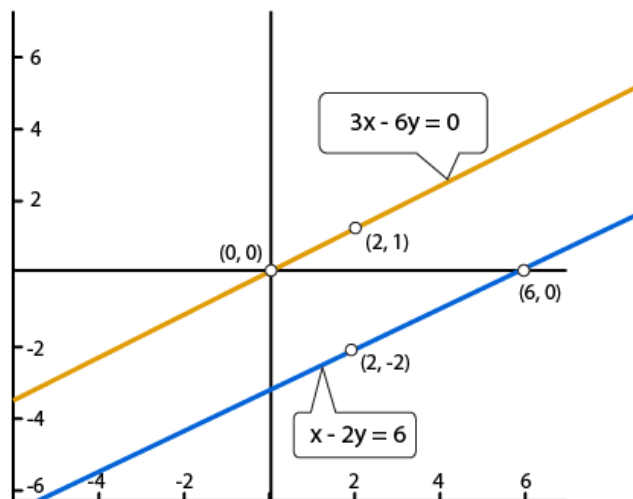
And, when $x = 2$

$\Rightarrow y = 2/2 = 1$

Thus we have the following table giving points on the line $3x - 6y = 0$

x	0	2
y	0	1

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines are parallel to each other. So, the two lines do not intersect.
Hence, the given system has no solutions.

7. $x + y = 4$
 $2x - 3y = 3$

Solution:

Given,
 $x + y = 4$ (i)
 $2x - 3y = 3$ (ii)

For equation (i),

$$\Rightarrow y = (4 - x)$$

When $x = 4$, we have $y = (4 - 4) = 0$

When $x = 2$, we have $y = (4 - 2) = 2$

Thus we have the following table giving points on the line $x + y = 4$

x	4	2
y	0	2

For equation (ii),

We solve for y:

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

So, when $x = 3$

$$y = (2(3) - 3)/3 = 1$$

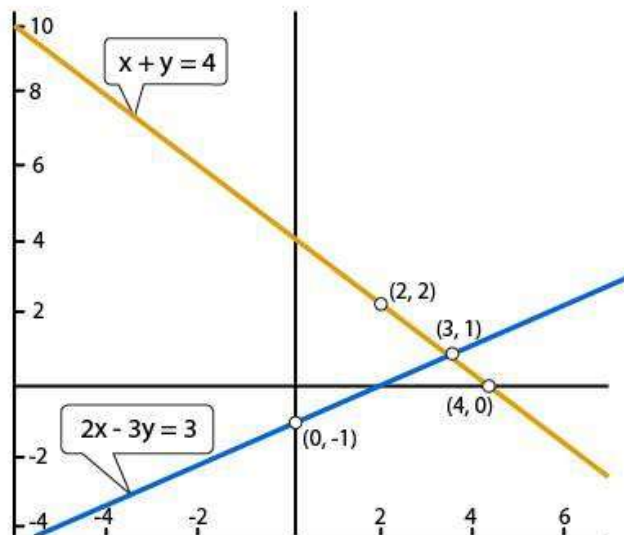
And, when $x = 0$

$$\Rightarrow y = (2(0) - 3)/3 = -1$$

Thus we have the following table giving points on the line $2x - 3y = 3$

x	3	0
y	1	-1

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (3, 1)
Hence, $x = 3$ and $y = 1$

8. $2x + 3y = 4$

$x - y + 3 = 0$

Solution:

Given,

$2x + 3y = 4$ (i)

$x - y + 3 = 0$ (ii)

For equation (i),

$\Rightarrow y = (4 - 2x) / 3$

When $x = -1$, we have $y = (4 - 2(-1))/3 = 2$

When $x = 2$, we have $y = (4 - 2(2))/3 = 0$

Thus we have the following table giving points on the line $2x + 3y = 4$

x	-1	2
y	2	0

For equation (ii),

We solve for y:

$\Rightarrow y = (x + 3)$

So, when $x = 0$

$y = (0 + 3) = 3$

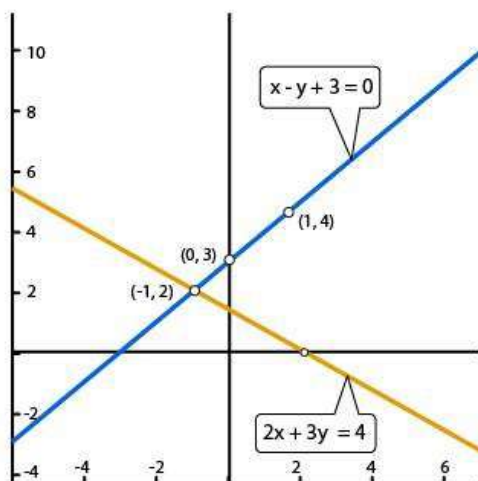
And, when $x = 1$

$\Rightarrow y = (1 + 3) = 4$

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

x	0	1
y	3	4

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (-1, 2)

Hence, $x = -1$ and $y = 2$

9. $2x - 3y + 13 = 0$

$3x - 2y + 12 = 0$

Solution:

Given,

$2x - 3y + 13 = 0$ (i)

$3x - 2y + 12 = 0$ (ii)

For equation (i),

$\Rightarrow y = (2x + 13) / 3$

When $x = -5$, we have $y = (2(-5) + 13) / 3 = 1$

When $x = -2$, we have $y = (2(-2) + 13) / 3 = 3$

Thus we have the following table giving points on the line $2x - 3y + 13 = 0$

x	-5	-2
y	1	3

For equation (ii),

We solve for y:

$\Rightarrow y = (3x + 12) / 2$

So, when $x = -4$

$y = (3(-4) + 12) / 2 = 0$

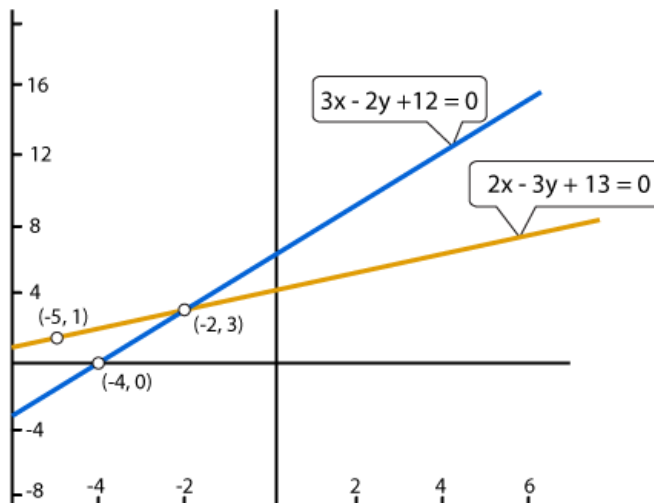
And, when $x = -2$

$\Rightarrow y = (3(-2) + 12) / 2 = 3$

Thus we have the following table giving points on the line $3x - 2y + 12 = 0$

x	-4	-2
y	0	3

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (-2, 3)
Hence, $x = -2$ and $y = 3$

10. $2x + 3y + 5 = 0$
 $3x + 2y - 12 = 0$

Solution:

Given,

$2x + 3y + 5 = 0 \dots\dots (i)$

$3x - 2y - 12 = 0 \dots\dots (ii)$

For equation (i),

$\Rightarrow y = -(2x + 5) / 3$

When $x = -4$, we have $y = -(2(-4) + 5) / 3 = 1$

When $x = -2$, we have $y = -(2(-2) + 5) / 3 = -1$

Thus we have the following table giving points on the line $2x + 3y + 5 = 0$

x	-4	-1
y	1	-1

For equation (ii),

We solve for y:

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

So, when $x = 4$

$y = (3(4) - 12) / 2 = 0$

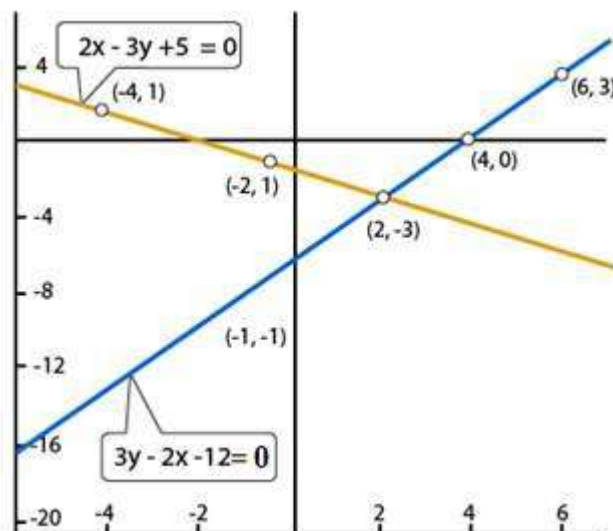
And, when $x = 6$

$\Rightarrow y = (3(6) - 12) / 2 = 3$

Thus we have the following table giving points on the line $3x - 2y - 12 = 0$

x	4	6
y	0	3

Graph of the equations (i) and (ii) is as below:



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Clearly the two lines intersect at a single point P (2, -3)
Hence, $x = 2$ and $y = -3$

Show graphically that each one of the following systems of equation has infinitely many solution:

11. $2x + 3y = 6$
 $4x + 6y = 12$

Solution:

Given,
 $2x + 3y = 6$ (i)
 $4x + 6y = 12$ (ii)

For equation (i),
 $\Rightarrow y = (6 - 2x) / 3$
When $x = 0$, we have $y = (6 - 2(0))/3 = 2$
When $x = 3$, we have $y = (6 - 2(3))/3 = 0$

Thus we have the following table giving points on the line $2x + 3y = 6$

x	0	3
y	2	0

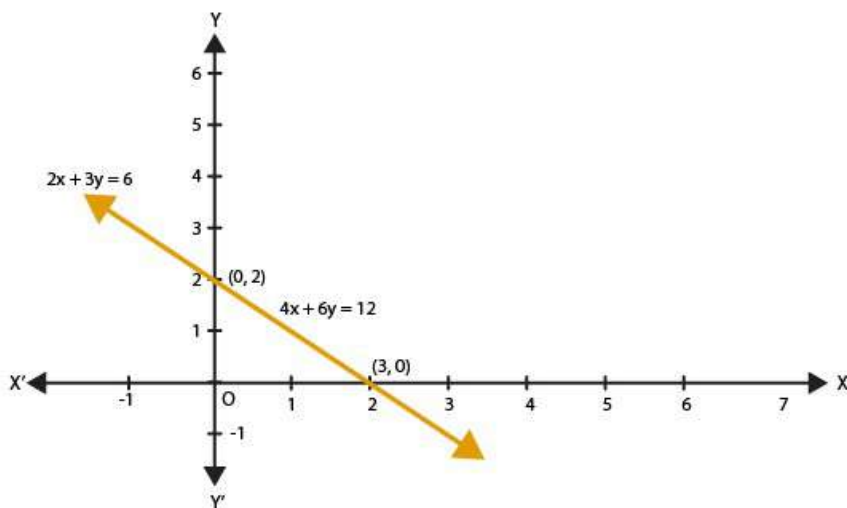
For equation (ii),
We solve for y:

$\Rightarrow y = (12 - 4x)/6$
So, when $x = 0$
 $y = (12 - 4(0))/6 = 2$
And, when $x = 3$
 $\Rightarrow y = (12 - 4(3))/6 = 0$

Thus we have the following table giving points on the line $4x + 6y = 12$

x	0	3
y	2	0

Graph of the equations (i) and (ii) is as below:



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Thus, the graphs of the two equations are coincident.
Hence, the system of equations has infinitely many solutions.

12. $x - 2y = 5$
 $3x - 6y = 15$

Solution:

Given,
 $x - 2y = 5 \dots\dots (i)$
 $3x - 6y = 15 \dots\dots (ii)$

For equation (i),
 $\Rightarrow y = (x - 5) / 2$
When $x = 3$, we have $y = (3 - 5) / 2 = -1$
When $x = 5$, we have $y = (5 - 5) / 2 = 0$

Thus we have the following table giving points on the line $x - 2y = 5$

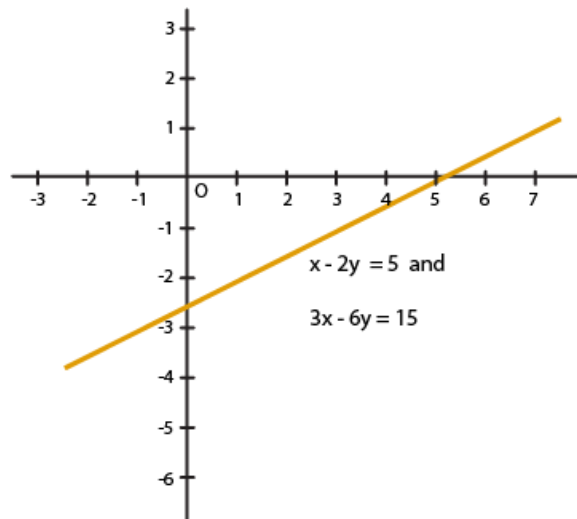
x	3	5
y	-1	0

For equation (ii),
We solve for y:
 $\Rightarrow y = (3x - 15) / 6$
So, when $x = 1$
 $y = (3(1) - 15) / 6 = -2$
And, when $x = -1$
 $\Rightarrow y = (3(-1) - 15) / 6 = -3$

Thus we have the following table giving points on the line $3x - 6y = 15$

x	1	-1
y	-2	-3

Graph of the equations (i) and (ii) is as below:



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Thus, the graphs of the two equations are coincident.

Hence, the system of equations has infinitely many solutions.

13. $3x + y = 8$

$6x + 2y = 16$

Solution:

Given,

$3x + y = 8 \dots\dots (i)$

$6x + 2y = 16 \dots\dots (ii)$

For equation (i),

$\Rightarrow y = (8 - 3x)$

When $x = 2$, we have $y = (8 - 3(2)) = 2$

When $x = 3$, we have $y = (8 - 3(3)) = -1$

Thus we have the following table giving points on the line $3x + y = 8$

x	2	3
y	2	-1

For equation (ii),

We solve for y:

$\Rightarrow y = (16 - 6x)/2$

So, when $x = 3$

$y = (16 - 6(3))/2 = -1$

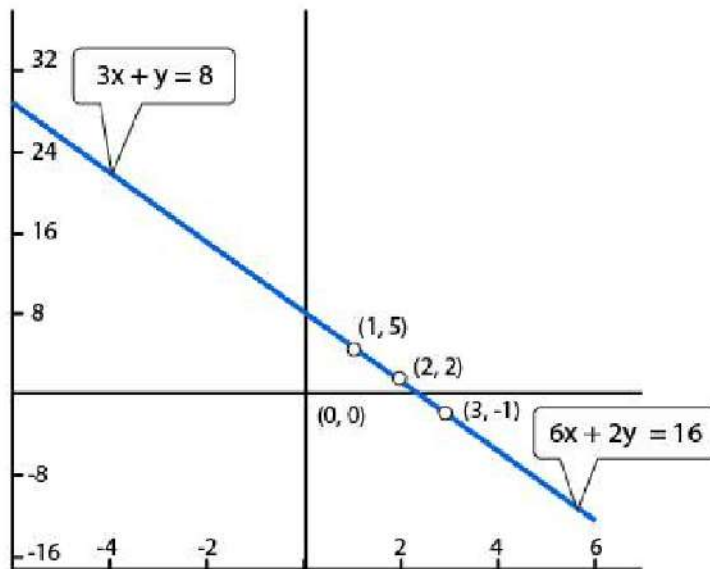
And, when $x = 1$

$\Rightarrow y = (16 - 6(1))/2 = 5$

Thus we have the following table giving points on the line $6x + 2y = 16$

x	3	1
y	-1	5

Graph of the equations (i) and (ii) is as below:



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Thus, the graphs of the two equations are coincident.
Hence, the system of equations has infinitely many solutions.

14. $x - 2y + 11 = 0$
 $3x + 6y + 33 = 0$

Solution:

Given,
 $x - 2y + 11 = 0$ (i)
 $3x - 6y + 33 = 0$ (ii)

For equation (i),
 $\Rightarrow y = (x + 11)/2$
When $x = -1$, we have $y = (-1 + 11)/2 = 5$
When $x = -3$, we have $y = (-3 + 11)/2 = 4$

Thus we have the following table giving points on the line $x - 2y + 11 = 0$

x	-1	-3
y	5	4

For equation (ii),

We solve for y:

$$\Rightarrow y = (3x + 33)/6$$

So, when $x = 1$

$$y = (3(1) + 33)/6 = 6$$

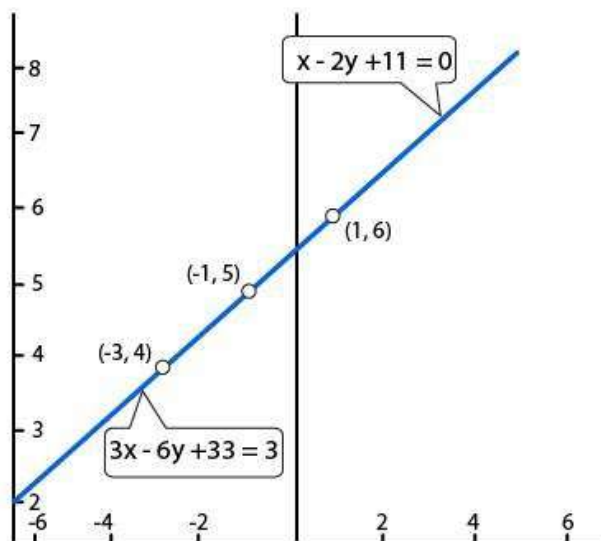
And, when $x = -1$

$$\Rightarrow y = (3(-1) + 33)/6 = 5$$

Thus we have the following table giving points on the line $3x - 6y + 33 = 0$

x	1	-1
y	6	5

Graph of the equations (i) and (ii) is as below:



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Thus, the graphs of the two equations are coincident.
Hence, the system of equations has infinitely many solutions.

Show graphically that each one of the following systems of equations is in-consistent (i.e has no solution):

15. $3x - 5y = 20$

$6x - 10y = -40$

Solution:

Given,

$3x - 5y = 20$ (i)

$6x - 10y = -40$ (ii)

For equation (i),

$\Rightarrow y = (3x - 20)/5$

When $x = 5$, we have $y = (3(5) - 20)/5 = -1$

When $x = 0$, we have $y = (3(0) - 20)/5 = -4$

Thus we have the following table giving points on the line $3x - 5y = 20$

x	5	0
y	-1	-4

For equation (ii),

We solve for y:

$\Rightarrow y = (6x + 40)/10$

So, when $x = 0$

$y = (6(0) + 40)/10 = 4$

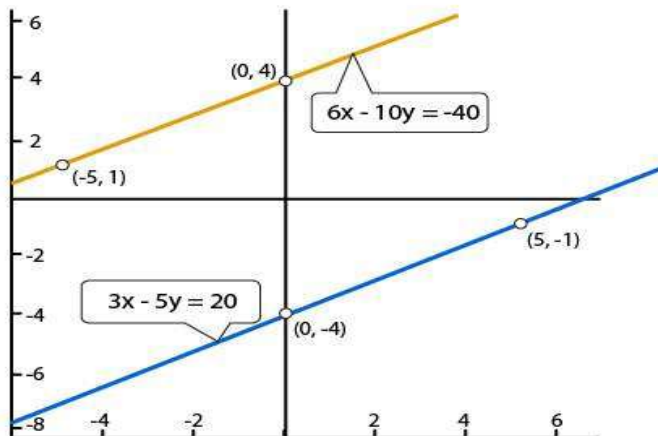
And, when $x = -5$

$\Rightarrow y = (6(-5) + 40)/10 = 1$

Thus we have the following table giving points on the line $6x - 10y = -40$

x	0	-5
y	4	1

Graph of the equations (i) and (ii) is as below:



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It is clearly seen that, there is no common point between these two lines.
Hence, the given systems of equations is in-consistent.

16. $x - 2y = 6$
 $3x - 6y = 0$

Solution:

Given,
 $x - 2y = 6$ (i)
 $3x - 6y = 0$ (ii)

For equation (i),
 $\Rightarrow y = (x - 6)/2$
When $x = 6$, we have $y = (6 - 6)/2 = 0$
When $x = 2$ we have $y = (2 - 6)/2 = -2$

Thus we have the following table giving points on the line $x - 2y = 6$

x	6	2
y	0	-2

For equation (ii),
We solve for y:

$\Rightarrow y = x/2$

So, when $x = 0$

$y = 0/2 = 0$

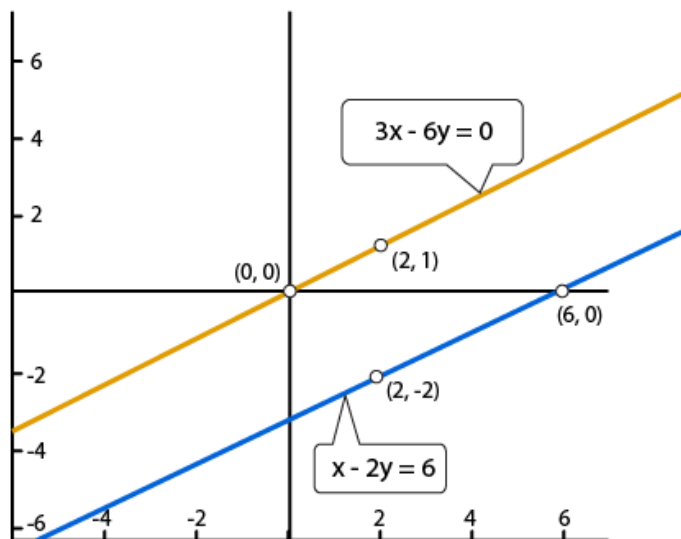
And, when $x = 2$

$\Rightarrow y = 2/2 = 1$

Thus we have the following table giving points on the line $3x - 6y = 0$

x	0	2
y	0	1

Graph of the equations (i) and (ii) is as below:



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It is clearly seen that, there is no common point between these two lines.
Hence, the given systems of equations is in-consistent.

$$17. \begin{aligned} 2y - x &= 9 \\ 6y - 3x &= 21 \end{aligned}$$

Solution:

Given,
 $2y - x = 9 \dots\dots (i)$
 $6y - 3x = 21 \dots\dots (ii)$

For equation (i),
 $\Rightarrow y = (x + 9)/2$
When $x = -3$, we have $y = (-3 + 9)/2 = 3$
When $x = -1$, we have $y = (-1 + 9)/2 = 4$

Thus we have the following table giving points on the line $2y - x = 9$

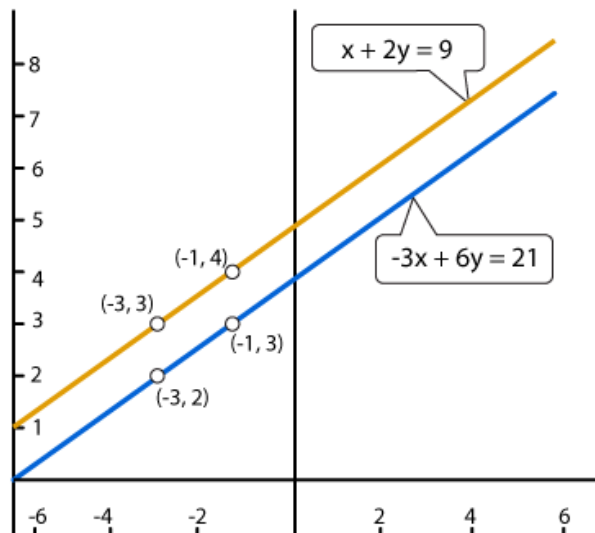
x	-3	-1
y	3	4

For equation (ii),
We solve for y:
 $\Rightarrow y = (21 + 3x)/6$
So, when $x = -3$
 $y = (21 + 3(-3))/6 = 2$
And, when $x = -1$
 $\Rightarrow y = (21 + 3(-1))/6 = 3$

Thus we have the following table giving points on the line $6y - 3x = 21$

x	-3	-1
y	2	3

Graph of the equations (i) and (ii) is as below:



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It is clearly seen that, there is no common point between these two lines.
Hence, the given systems of equations is in-consistent.

18. $3x - 4y - 1 = 0$
 $2x - (8/3)y + 5 = 0$

Solution:

Given,

$$3x - 4y - 1 = 0 \dots\dots (i)$$

$$2x - (8/3)y + 5 = 0 \dots\dots (ii)$$

For equation (i),

$$\Rightarrow y = (3x - 1)/4$$

When $x = -1$, we have $y = (3(-1) - 1)/4 = -1$

When $x = 3$, we have $y = (3(3) - 1)/4 = 2$

Thus we have the following table giving points on the line $3x - 4y - 1 = 0$

x	-1	3
y	-1	2

For equation (ii),

We solve for y:

$$\Rightarrow y = (6x + 15)/8$$

So, when $x = -2.5$

$$y = (6(-2.5) + 15)/8 = 0$$

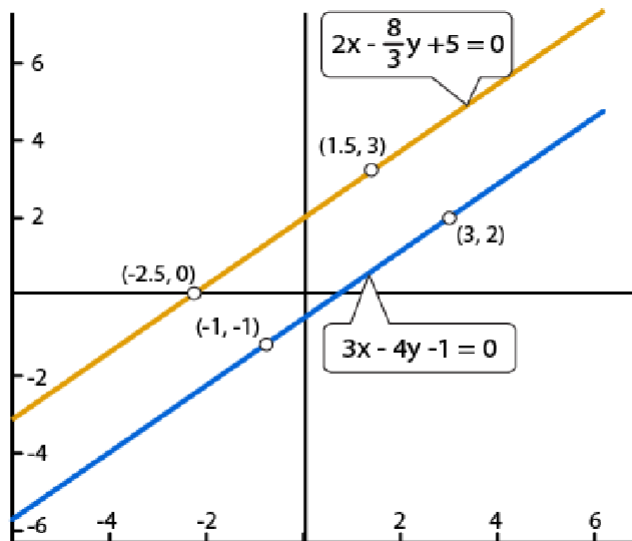
And, when $x = 1.5$

$$\Rightarrow y = (6(1.5) + 15)/8 = 3$$

Thus we have the following table giving points on the line $2x - (8/3)y + 5 = 0$

x	-2.5	1.5
y	0	3

Graph of the equations (i) and (ii) is as below:



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It is clearly seen that, there is no common point between these two lines.
Hence, the given systems of equations is in-consistent.

19. Determine graphically the vertices of the triangle, the equations of whose sides are given below:

(i) $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$

Solution:

Given,

$$2y - x = 8 \dots\dots (i)$$

$$5y - x = 14 \dots\dots (ii)$$

$$y - 2x = 1 \dots\dots (iii)$$

For equation (i),

$$\Rightarrow y = (x + 8)/2$$

When $x = -4$, we have $y = (-4 + 8)/2 = 2$

When $x = 0$, we have $y = (0 + 8)/2 = 4$

Thus we have the following table giving points on the line $2y - x = 8$

x	-4	0
y	2	4

For equation (ii),

We solve for y:

$$\Rightarrow y = (x + 14)/5$$

So, when $x = -4$

$$y = ((-4) + 14)/5 = 2$$

And, when $x = 1$

$$\Rightarrow y = (1 + 14)/5 = 3$$

Thus we have the following table giving points on the line $5y - x = 14$

x	-4	1
y	2	3

Finally, for equation (iii),

$$\Rightarrow y = (2x + 1)$$

When $x = -1$, we have $y = (2(-1) + 1) = -1$

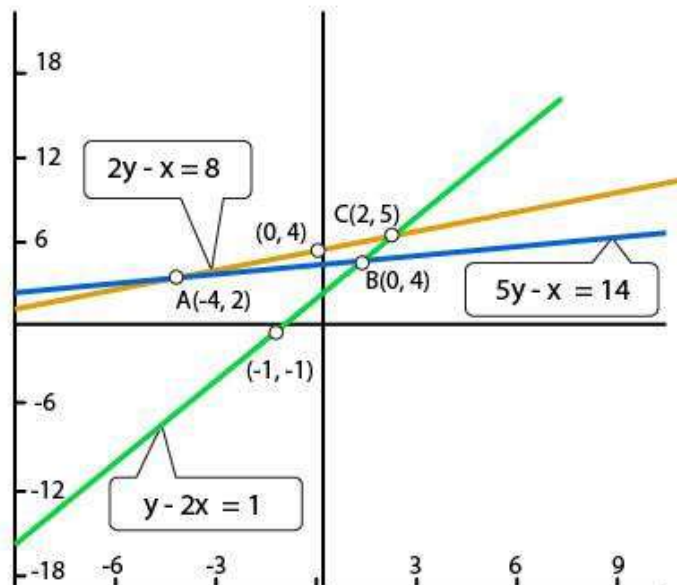
When $x = 1$, we have $y = (2(1) + 1) = 3$

Thus we have the following table giving points on the line $y - 2x = 1$

x	-1	1
y	1	3

Graph of the equations (i), (ii) and (iii) is as below:

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From the above graph, we observe that the lines taken in pairs intersect at points A(-4,2), B(1,3) and C(2,5)

Hence the vertices of the triangle are A(-4, 2), B(1, 3) and C(2,5)

(ii) $y = x$, $y = 0$ and $3x + 3y = 10$

Solution:

Given,

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

$$y = 0 \dots\dots (ii)$$

$$3x + 3y = 10 \dots\dots (iii)$$

For equation (i),

When $x = 1$, we have $y = 1$

When $x = -2$, we have $y = -2$

Thus we have the following table giving points on the line $y = x$

x	1	-2
y	1	-2

For equation (ii),

When $x = 0$

$$y = 0$$

And, when $x = 10/3$

$$\Rightarrow y = 0$$

Thus we have the following table giving points on the line $y = 0$

x	0	10/3
y	0	10/3

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Finally, for equation (iii),

$$\Rightarrow y = (10 - 3x)/3$$

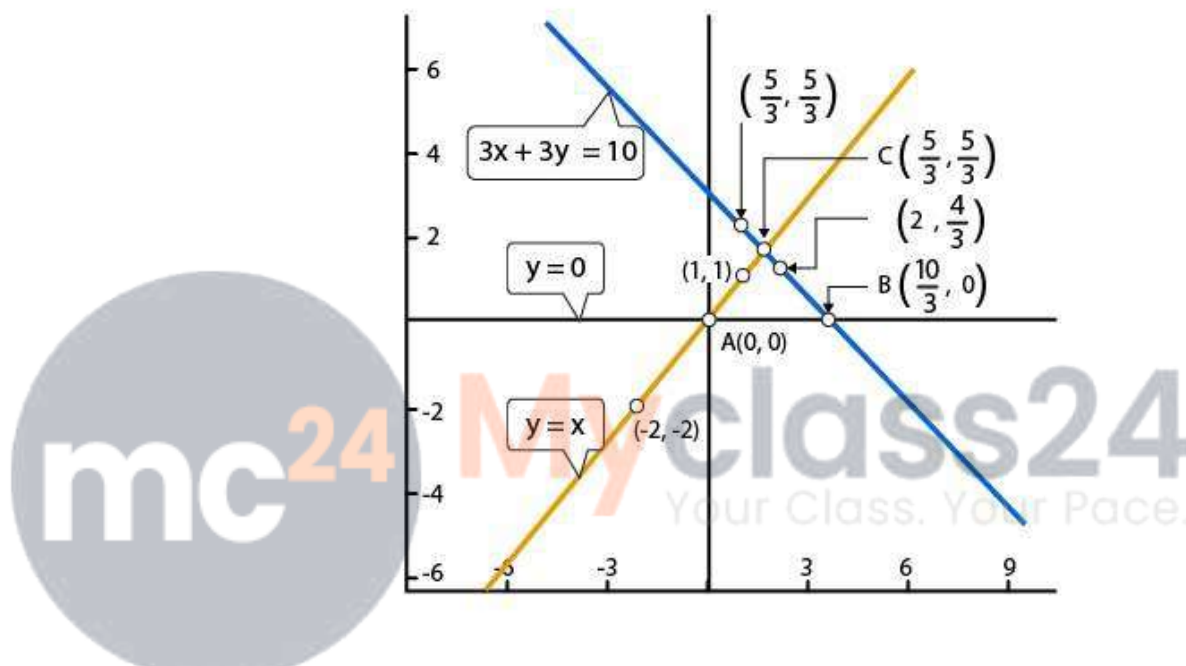
When $x = 1$, we have $y = (10 - 3(1))/3 = 7/3$

When $x = 2$, we have $y = (10 - 3(2))/3 = 4/3$

Thus we have the following table giving points on the line $3x + 3y = 10$

x	1	2
y	$7/3$	$4/3$

Graph of the equations (i), (ii) and (iii) is as below:



From the above graph, we observe that the lines taken in pairs intersect at points $A(0,0)$, $B(10/3,0)$ and $C(5/3, 5/3)$

Hence the vertices of the triangle are $A(0,0)$, $B(10/3,0)$ and $C(5/3, 5/3)$.

20. Determine graphically whether the system of equations $x - 2y = 2$, $4x - 2y = 5$ is consistent or in-consistent.

Solution:

Given,

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

$$4x - 2y = 5 \dots\dots (ii)$$

For equation (i),

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

When $x = 2$, we have $y = (2 - 2)/2 = 0$

When $x = 0$, we have $y = (0 - 2)/2 = -1$

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Thus we have the following table giving points on the line $x - 2y = 2$

x	2	0
y	0	-1

For equation (ii),

We solve for x:

$$\Rightarrow x = (5 + 2y)/4$$

So, when $y = 0$

$$x = (5 + 2(0))/4 = 5/4$$

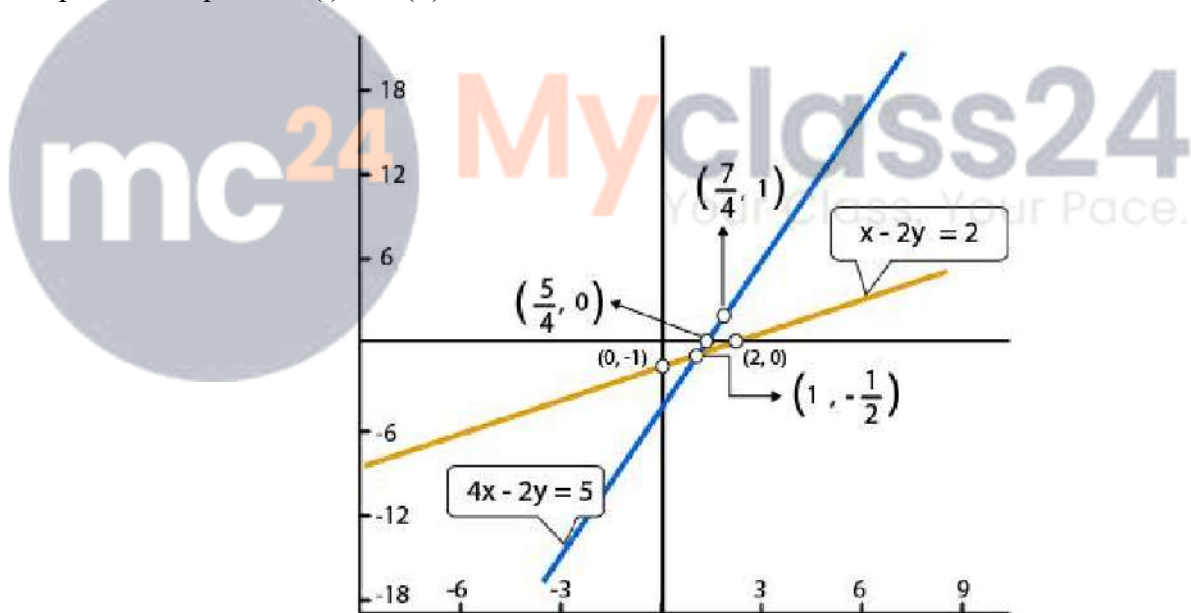
And, when $y = 1.5$

$$\Rightarrow x = (5 + 2(1))/4 = 7/4$$

Thus we have the following table giving points on the line $4x - 2y = 5$

x	5/4	7/4
y	0	1

Graph of the equations (i) and (ii) is as below:



It is clearly seen that the two lines intersect at $(1, 0)$

Hence, the system of equations is consistent.

21. Determine by drawing graphs, whether the following system of linear equation has a unique solution or not:

(i) $2x - 3y = 6$ and $x + y = 1$

Solution:

Given,

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$$2x - 3y = 6 \dots\dots (i)$$

$$x + y = 1 \dots\dots (ii)$$

For equation (i),

$$\Rightarrow y = (2x - 6)/3$$

When $x = 3$, we have $y = (2(3) - 6)/3 = 0$

When $x = 0$, we have $y = (2(0) - 6)/3 = -2$

Thus we have the following table giving points on the line $2x - 3y = 6$

x	3	0
y	0	-2

For equation (ii),

We solve for y:

$$\Rightarrow y = (1 - x)$$

So, when $x = 0$

$$y = (1 - 0) = 1$$

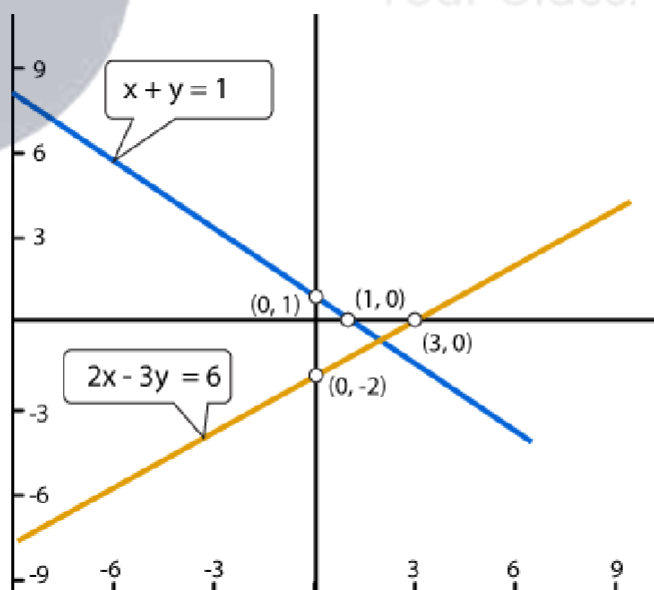
And, when $x = 1$

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

Thus we have the following table giving points on the line $x + y = 1$

x	0	1
y	1	0

Graph of the equations (i) and (ii) is as below:



It's seen clearly that the two lines intersect at one.

Thus, we can conclude that the system of equations has a unique solution.

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(ii) $2y = 4x - 6$ and $2x = y + 3$

Solution:

Given,

$$2y = 4x - 6 \dots\dots (i)$$

$$2x = y + 3 \dots\dots (ii)$$

For equation (i),

$$\Rightarrow y = (4x - 6)/2$$

When $x = 1$, we have $y = (4(1) - 6)/2 = -1$

When $x = 4$, we have $y = (4(4) - 6)/2 = 5$

Thus we have the following table giving points on the line $2y = 4x - 6$

x	1	4
y	-1	5

For equation (ii),

We solve for y:

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

So, when $x = 2$

$$y = 2(2) - 3 = 1$$

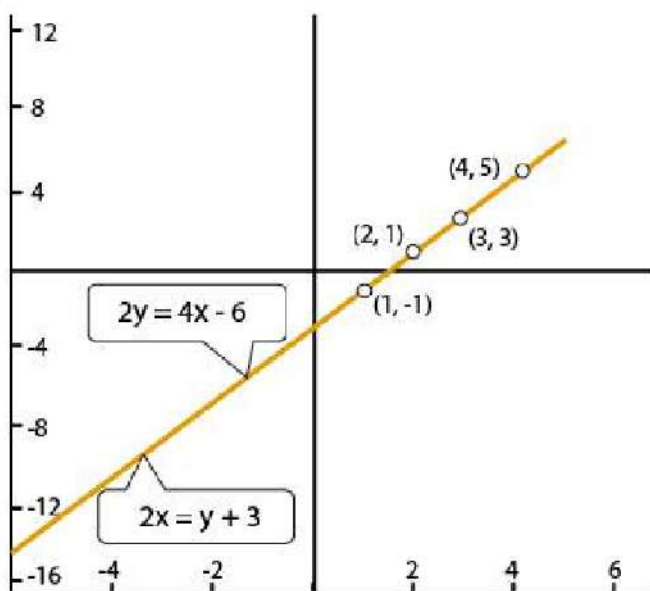
And, when $x = 3$

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

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

x	2	3
y	1	3

Graph of the equations (i) and (ii) is as below:



We see that the two lines are coincident. And, hence it has infinitely many solutions. Therefore, the system of equations does not have a unique solution.