UNIT 5

Linear Inequalities and Linear Programming

Solved Exercise 5.1

Q1. Graph the solution set of each of the following linear inequalities in xy-plane:

i. $2x + y \leq 6$

Solution

$2x+y \leq 6$ (1)

$2x + y = 6$ _____(2)

Putting $x = 0$ in (2) $\Rightarrow y = 6$

(0,6) is a point on (2)

Putting $y = 0$ in (2)

$x + 0 = 6$

$\Rightarrow \quad x = 3$

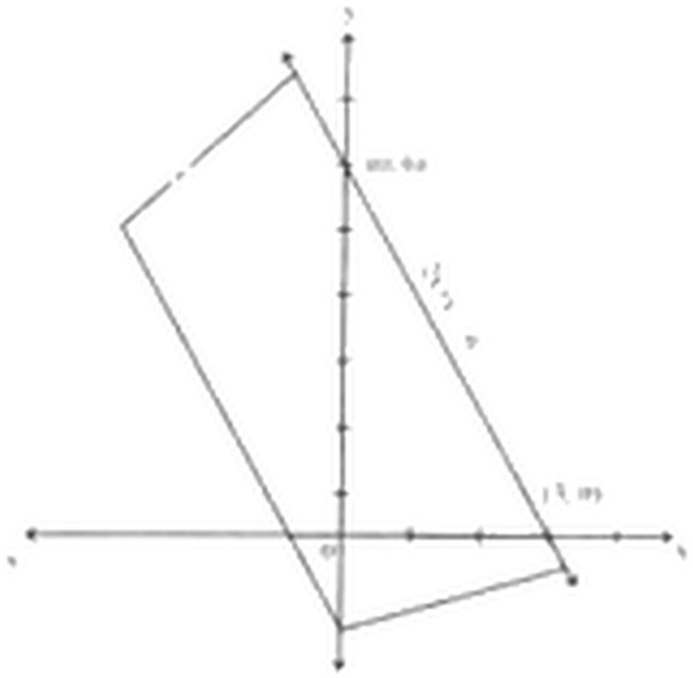
(3,0) is another point on (2)

Putting $x = 0$ $y = 0$ in (1)

$0 + 0 < 6$

$0 < 6$

Which is true. Hence graph is



ii. **$3x+7y \geq 21$ _____(1)**

$3x+7y = 21$ _____(2)

Putting $x = 0$ in (2) $\Rightarrow y = 3$

(0,3) is a point on (2)

Putting $y = 0$ in (2)

$3x + 0 = 21$

$\Rightarrow \quad x = 7$

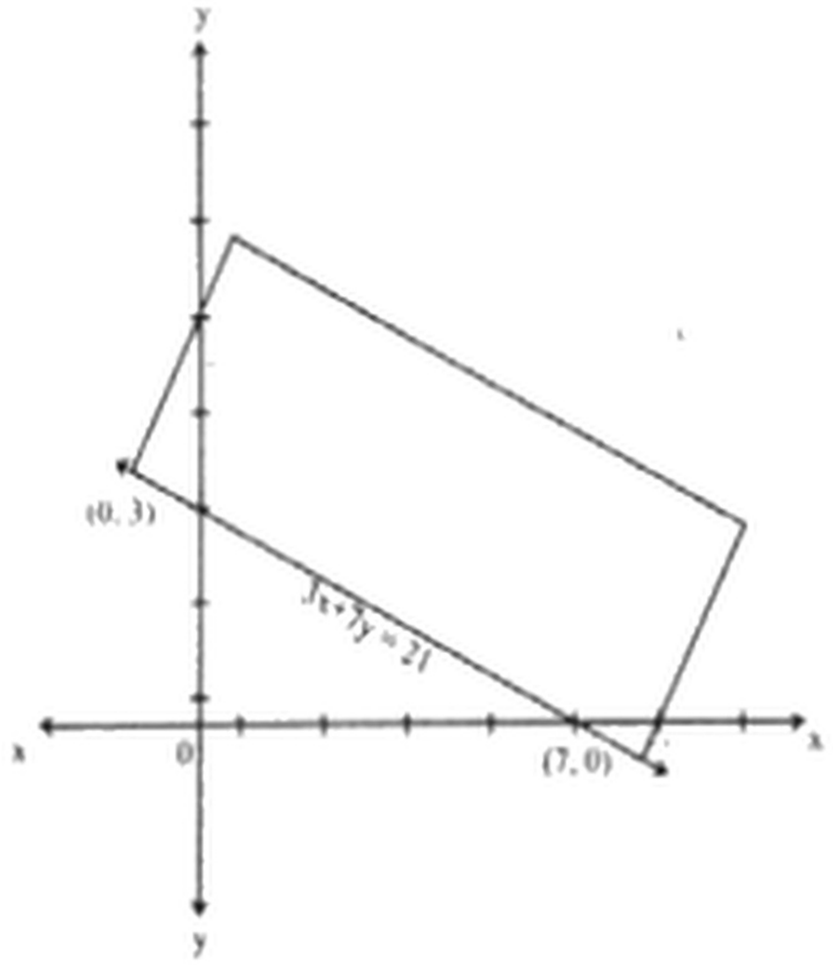
(7,0) is another point on (2)

Putting $x = 0$ $y = 0$ in (1)

$0 + 0 > \mathbf{21}$

$0 > 21$

Which is false. Hence graph is



iii. **3x-2y ≥ 6 _____(1)**

3x-2y = 6 _____(2)

Putting x = 0 in (2) ⇒ y =- 3

(0,-3) is a point on (2)

Putting y = 0 in (2)

3 x -0 = 6

⇒ x = 2

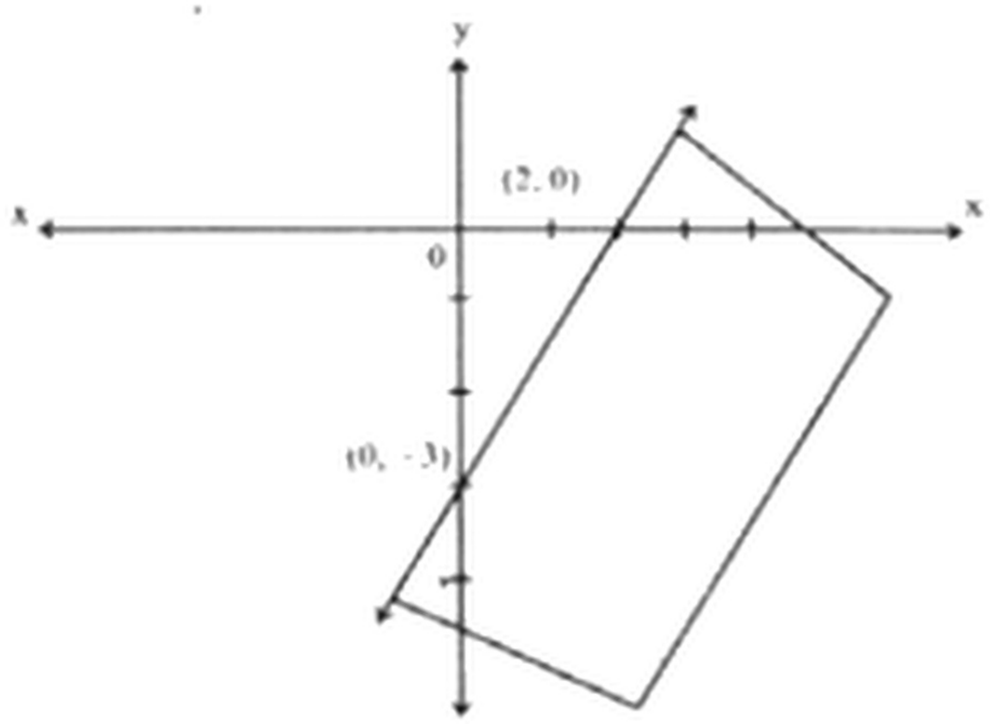
(2,0) is another point on (2)

Putting x = 0

0 + 0 > **6**

0 > 6

Which is false. Hence graph



iv. **5x-4y ≤ 20 _____(1)**

5x-4y = 20 _____(2)

Putting x = 0 in (2) ⇒ **0** – 2y = 20

(0,5) is a point on (2)

Putting y = 0 in (2)

5x-0 = 20

⇒ x = 4

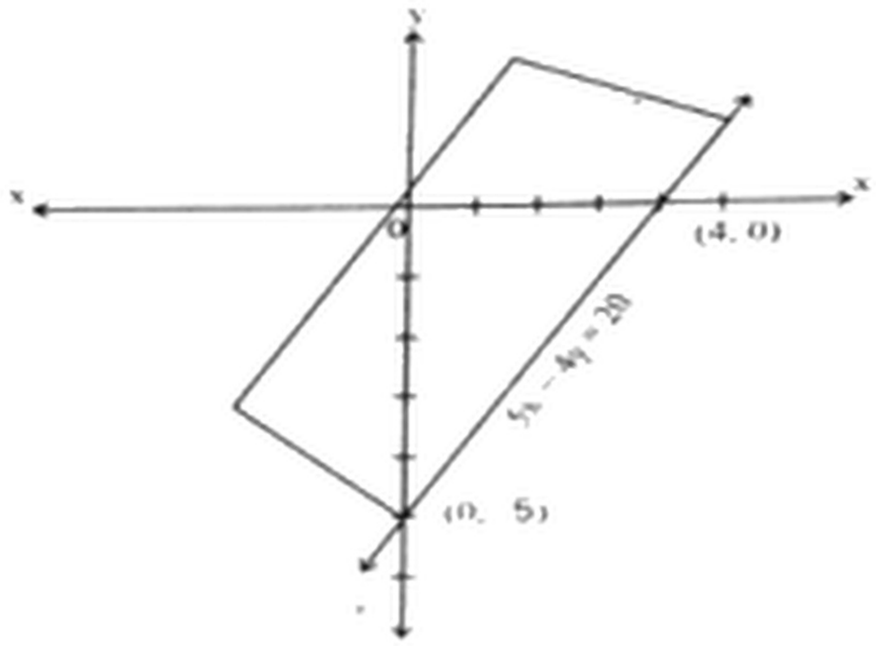
(4,0) is another point on (2)

Putting x = 0, y = 0 in (1)

0 + 0 < **20**

0 < 20

Which is true. Hence graph



v. $2x+1 \geq 0$ _____(1)

$2x+1 =$ _____(2)

From (2)

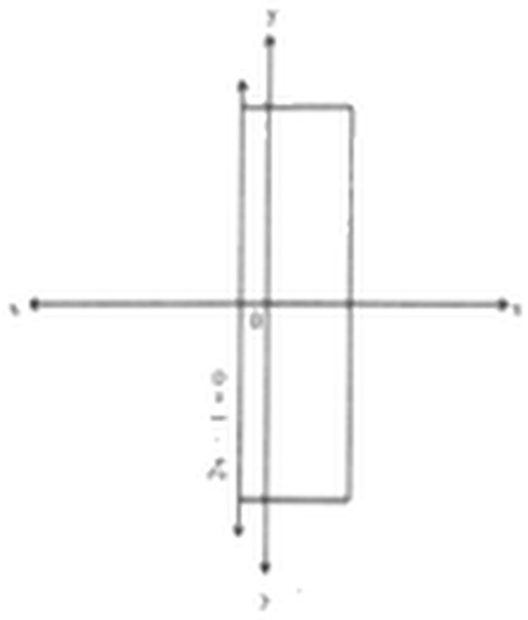
$$2x = -1 \Rightarrow x = \frac{-1}{2}$$

Putting $x = 0$ in (1)

$0 + 1 > 0$

$0 > 0$

Which is true. Hence graph



vi. $3y-4 \geq 0$ _____(1)

$3y - 4 =$ _____(2)

From (2)

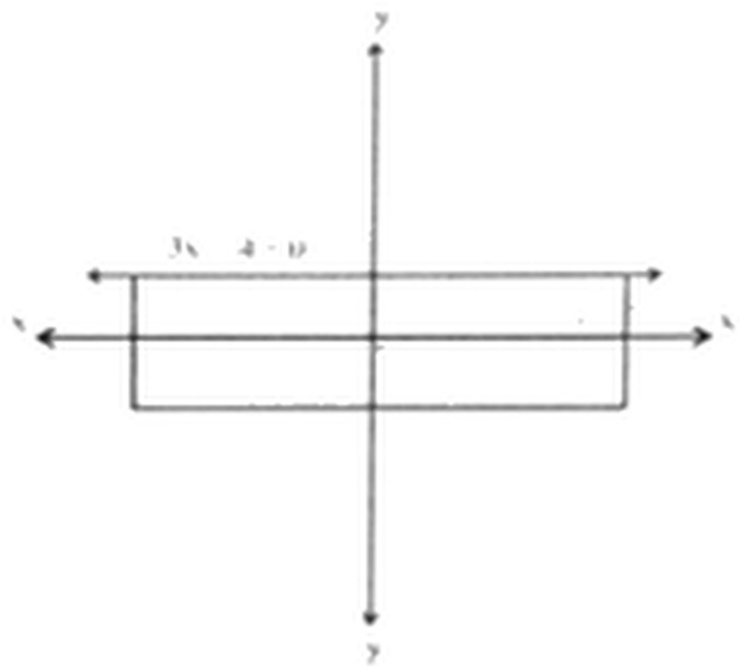
$$3y = 4 \Rightarrow y = \frac{4}{3}$$

Putting $y = 0$ in (1)

$0 - 4 < 0$

$0 < 0$

Which is true. Hence graph



Q2 Indicate the solution set of the following systems of linear inequalities by shading

(i) $2x-3y \leq 6$

$2x+3y \leq 12$

Solution

$2x-3y \leq 6$ _____(1)

$2x-3y = 6$ _____(3)

Putting $x = 0$ in (3)

$0-3y = 6 \Rightarrow y = -2$

$(0,-2)$ is a point on (3)

$2x+3y \leq 12$ _____(2)

$2x+3y = 12$ _____(4)

Putting $x = 0$ in (4)

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

$(0,4)$ is a point on (4)

Putting y = 0 in (3)

2 x -0 = 6

⇒ x = 3

(3,0) is another point on (3)

Putting x = 0 , y = 0 in (1)

0 - 0 < **6**

0 < 6

Which is true.

Putting y = 0 in (4)

2 x +0 = 12 ⇒ $x = 6$

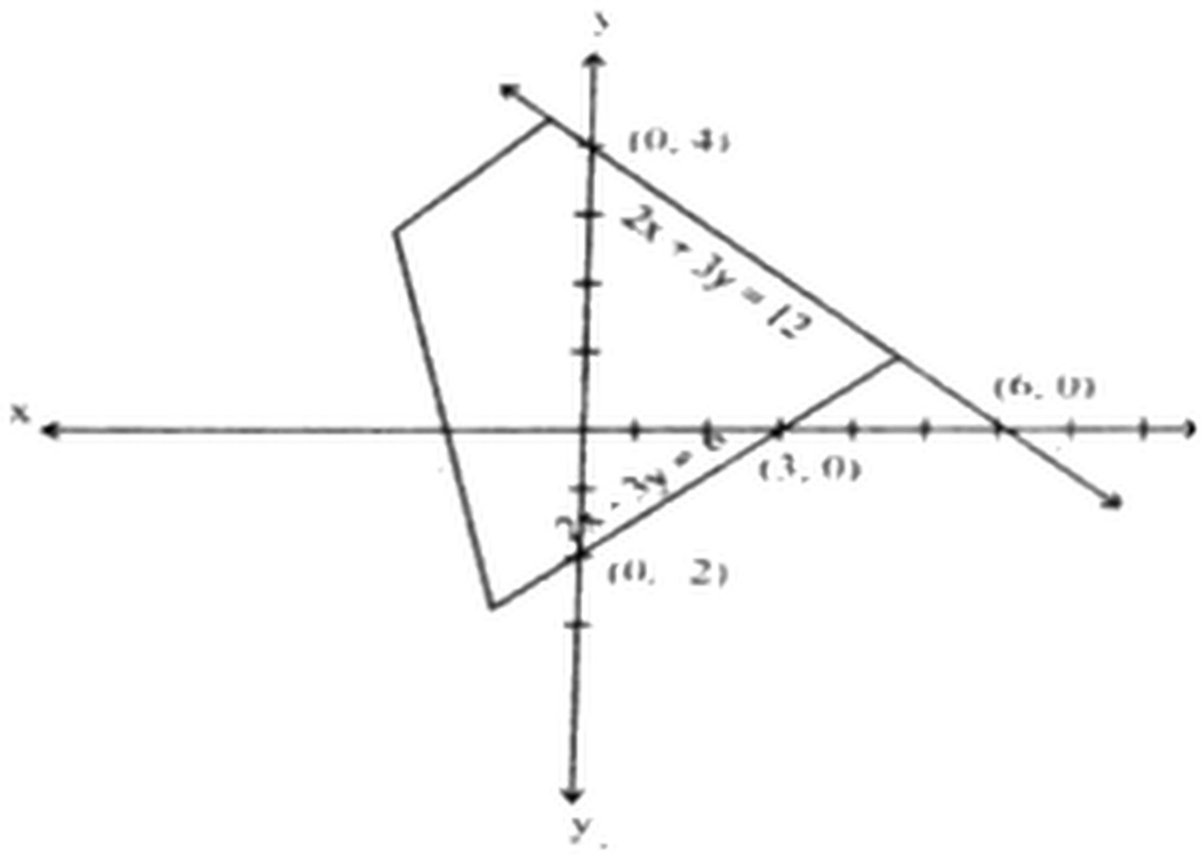
(6,0) is another point on (4)

putting x = 0, y = 0 in (2)

0 + 0 < **12**

0 < 12

Which is true



(ii)

x +y ≤ 5 _____(1)

x + y = 5 _____(3)

Putting x = 0 in (3)

0+y = 5 ⇒ y = 5

(0,5) is a point on (3)

Putting y = 0 in (3)

x-y ≤ 1 _____(2)

x -y = 1 _____(4)

Putting x = 0 in (4)

0-y = 1 ⇒ y = -1

(0,1) is a point on (4)

Putting y = 0 in (4)

x +0 = 5

⇒ x = 5

(5,0) is another point on (3)

Putting x = 0 , y = 0 in (1)

0 + 0 < **5**

0 < 5

Which is false.

2x-0 = 1 ⇒ $\boldsymbol{x = 1}$

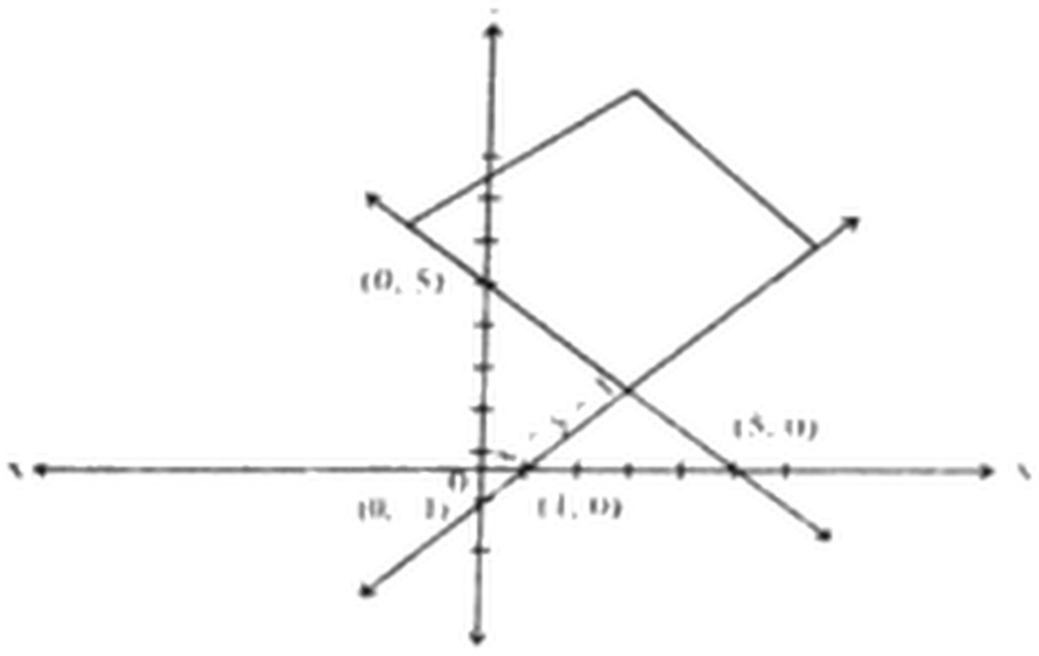
(1,0) is another point on (4)

putting x = 0, y = 0 in (2)

0 - 0 < **1**

0 < 1

Which is true



(iii) 3x-7y ≤ 21 _____(1)

3x -7 y = 21 _____(3)

Putting x = 0 in (3)

0-7y = 21 ⇒ y = 3

(0,3) is a point on (3)

Putting y = 0 in (3)

3x -0 = 21

⇒ x = 7

(7,0) is another point on (3)

Putting x = 0 , y = 0 in (1)

x-y ≤ 2 _____(2)

x -y = 2 _____(4)

Putting x = 0 in (4)

0-y = 2 ⇒ y = -2

(0,-2) is a point on (4)

Putting y = 0 in (4)

x -0 = 2 ⇒ $\boldsymbol{x = 2}$

(2,0) is another point on (4)

putting x = 0, y = 0 in (2)

$0 - 0 > \mathbf{21}$

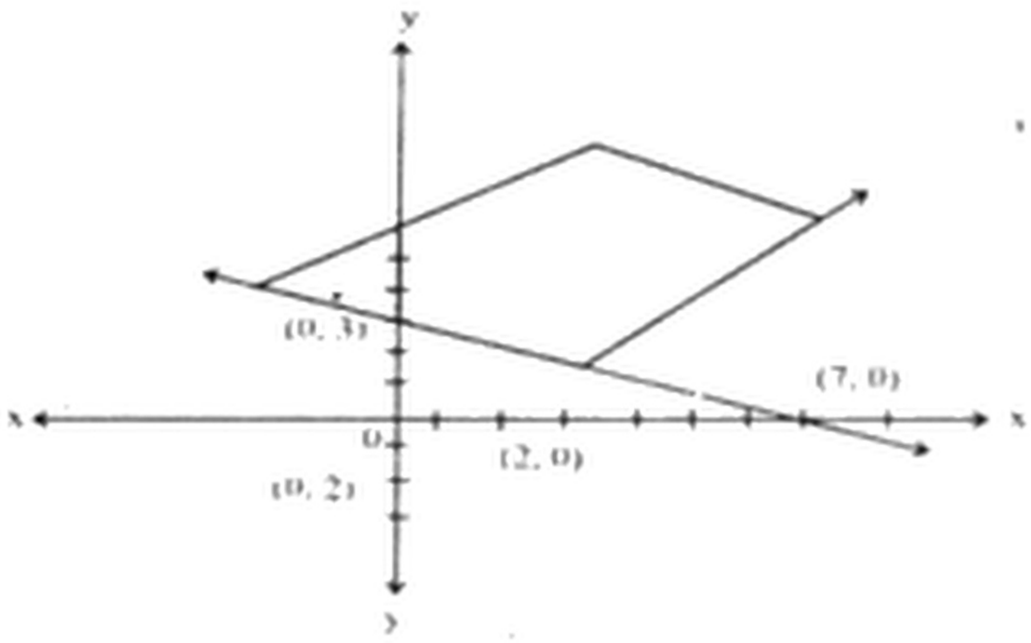
$0 > 21$

Which is true.

$0 - 0 < \mathbf{2}$

$0 < 2$

Which is true



(iv) $4x-3y \leq 12$ _____(1)

$4x - 3y = 12$ _____(3)

Putting $x = 0$ in (3)

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

(0,-4) is a point on (3)

(2)

Putting $y = 0$ in (3)

$4x - 0 = 12$

$\Rightarrow \quad x = 3$

(3,0) is another point on (3)

true

Putting $x = 0$, $y = 0$ in (1)

$0 - 0 > \mathbf{12}$

$0 > 12$

Which is true.

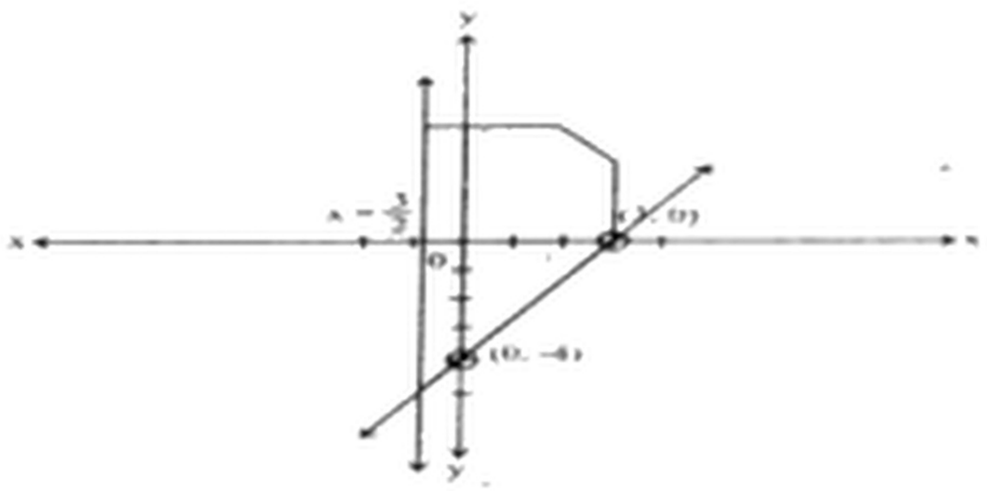
$x \geq \frac{-3}{2}$ _____(2)

$x = \frac{-3}{2} = 1.5$

Putting $x = 0$ in

$0 > \mathbf{-1.5}$

which is



(v) $3x+7y \leq 21$ _____(1)

$3x+7y = 21$ _____(3)

Putting $x = 0$ in (3)

$0+7y = 21 \Rightarrow y = 3$

(0,3) is a point on (3)

(4)

Putting $y = 0$ in (3)

$3x+0 = 21$

$\Rightarrow \quad x = 7$

(7,0) is another point on (3)

true

Putting $x = 0$, $y = 0$ in (1)

$0 + 0 > \mathbf{21}$

$0 > 21$

Which is false.

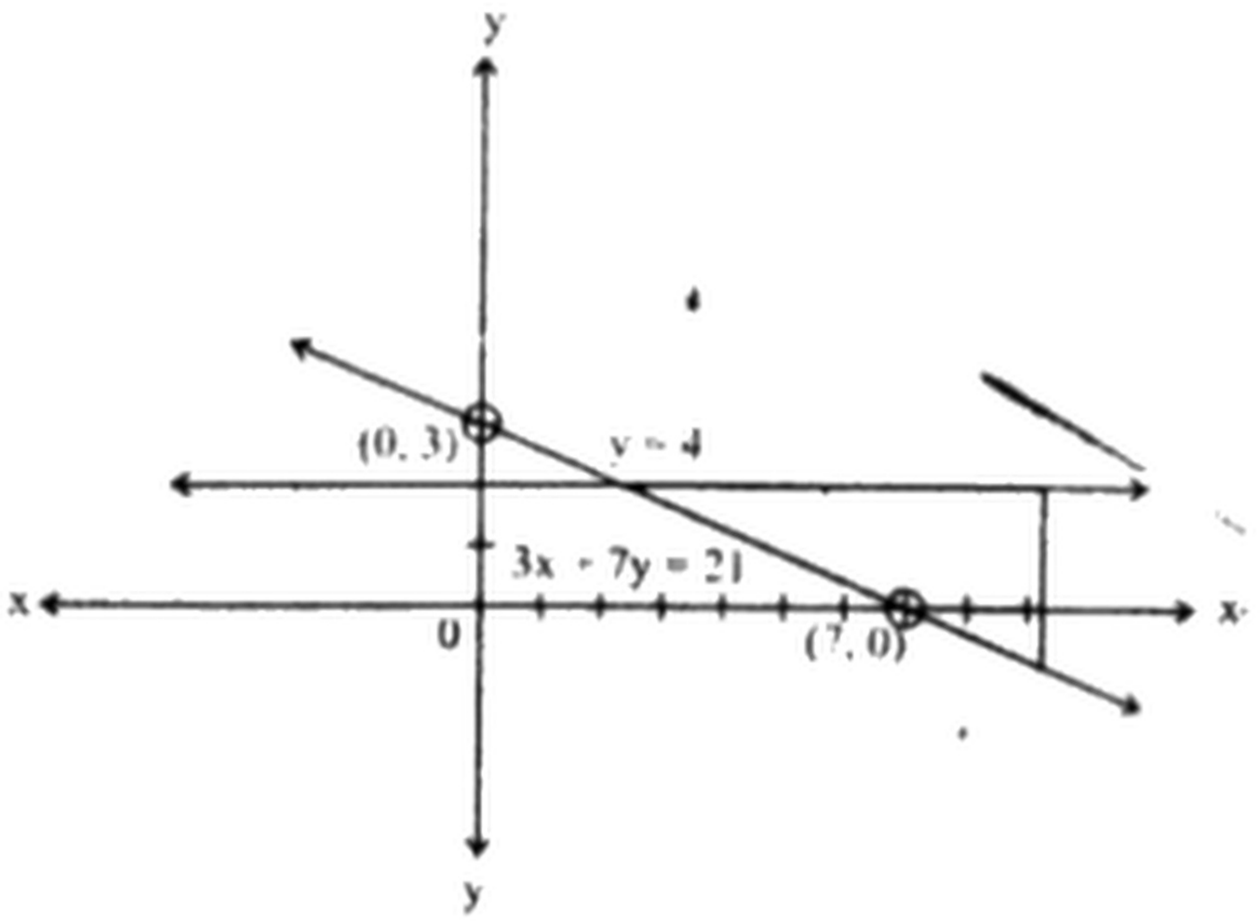
$y \leq \mathbf{4}$ _____(2)

$y = \mathbf{4}$ _____(4)

Putting $x = 0$ in

$0 < \mathbf{2}$

which is



3. Indicate the region of the following systems of linear inequalities by shading

Solution

(i) $2x - 3y \leq 6, 2x + 3y \leq 12, y \geq 0$

$2x-3y \leq 6$ _____(1)

$2x - 3y = 6$ _____(3)

Putting $x = 0$ in (3)

$0-3y = 6 \Rightarrow y = -2$

(0,2) is a point on (3)

Putting $y = 0$ in (3)

$2x - 0 = 6$

$\Rightarrow \quad x = 3$

(3,0) is another point on (3)

Putting $x = 0$, $y = 0$ in (1)

$0 - 0 < \mathbf{6}$

$0 < 6$

Which is false.

$2x+3y \leq 12$ _____(2)

$2x + 3y = 12$ _____(4)

Putting $x = 0$ in (4)

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

(0,4) is a point on (4)

Putting $y = 0$ in (4)

$2x + 0 = 12 \Rightarrow \boldsymbol{x = 6}$

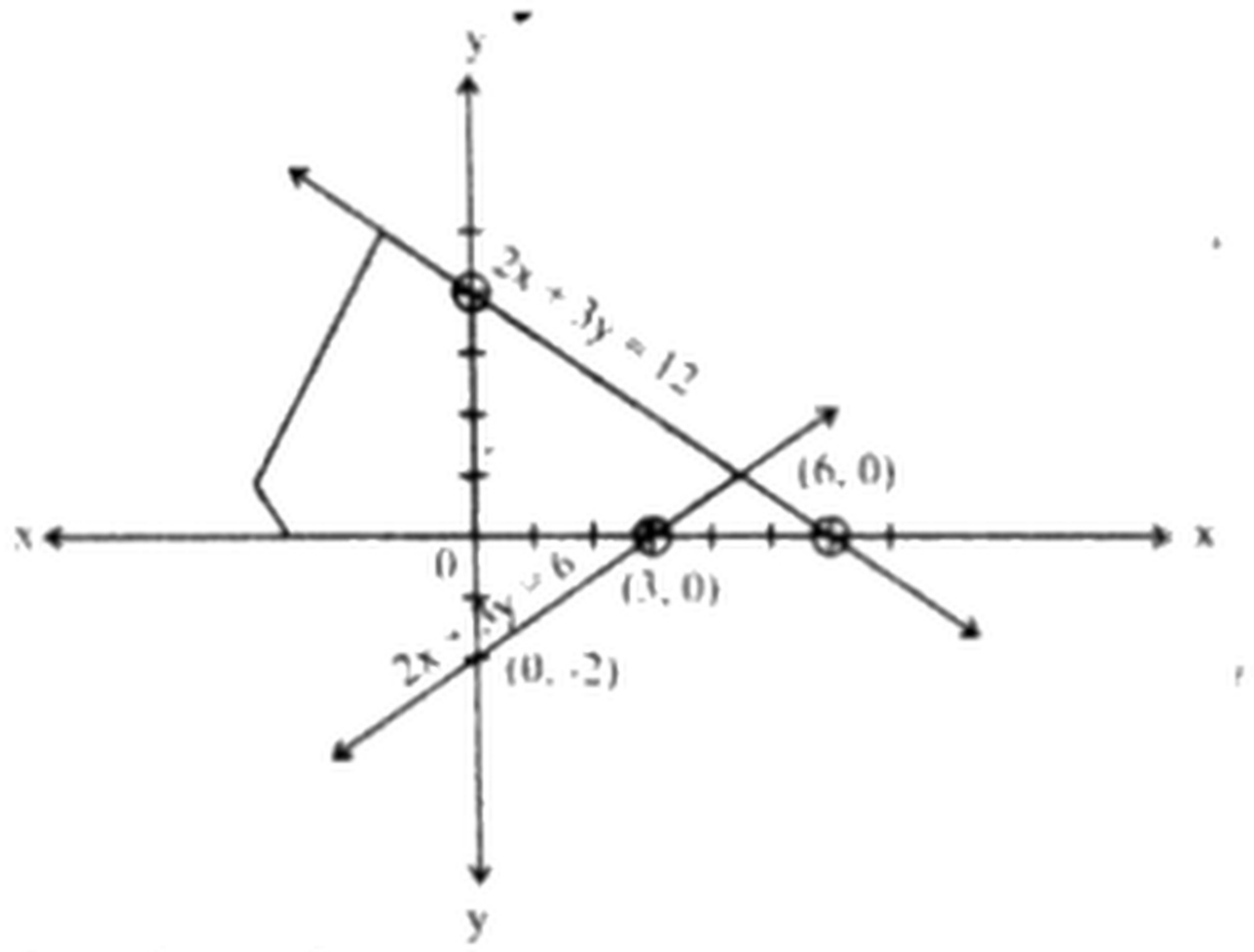
(6,0) is another point on (4)

putting $x = 0$, $y = 0$ in (2)

$0 + 0 < \mathbf{12}$

$0 < 12$

Which is true



(ii) $x + y \leq 5, y - 2x \leq 2, x \geq 0$

$x + y \leq 5$ _____(1)

$x + y = 5$ _____(3)

Putting $x = 0$ in (3)

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

(0,5) is a point on (3)

Putting $y = 0$ in (3)

$x + 0 = 5$

$\Rightarrow \quad x = 5$

(5,0) is another point on (3)

Putting $x = 0$, $y = 0$ in (1)

$0 - 0 < \mathbf{5}$

$0 < 5$

Which is false.

$y - 2x \leq 2$ _____(2)

$y - 2x = 2$ _____(4)

Putting $x = 0$ in (4)

$y - 0 = 2 \Rightarrow y =$

(0,2) is a point on (4)

Putting $y = 0$ in (4)

$0 - 2x = 2 \Rightarrow \boldsymbol{x = -1}$

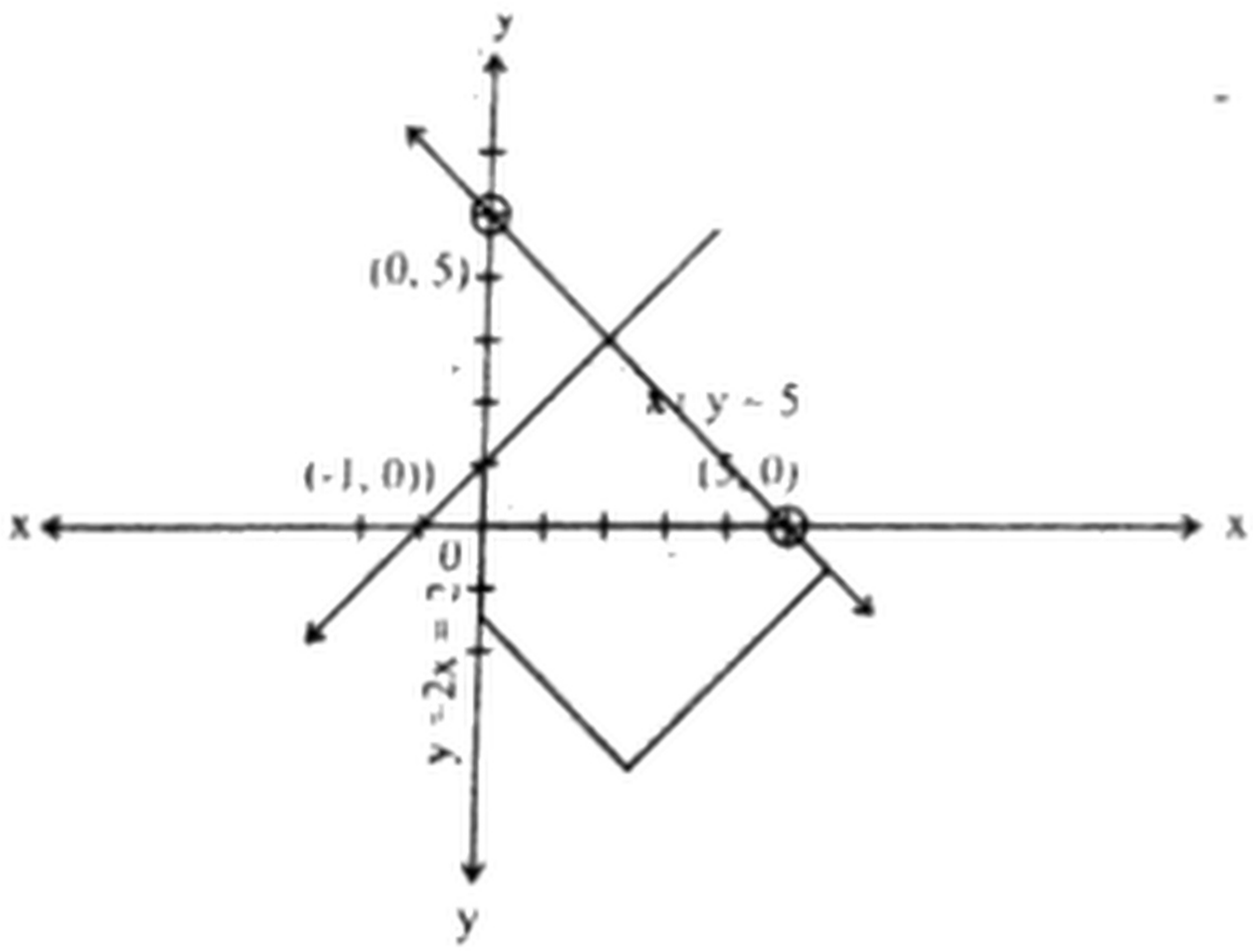
(-1,0) is another point on (4)

putting $x = 0, y = 0$ in (2)

$0 - 0 < \mathbf{2}$

$0 < 2$

Which is true



(iii) $x+y \geq 5, x-y \geq 1, y \geq 0$

$x+y \geq 5$ _____(1)

$x + y = 5$ _____(3)

Putting $x = 0$ in (3)

$0+y = 5 \Rightarrow y = 5$

(0,5) is a point on (3)

Putting $y = 0$ in (3)

$x + 0 = 5$

$\Rightarrow \quad x = 5$

(5,0) is another point on (3)

Putting $x = 0$, $y = 0$ in (1)

$0 + 0 > \mathbf{5}$

$0 > 5$

Which is false.

$x-y \geq 1$_____(2)

$x - y = 2$ _____(4)

Putting $x = 0$ in (4)

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

(0,2) is a point on (4)

Putting $y = 0$ in (4)

$x-0 = 1 \Rightarrow \boldsymbol{x = 1}$

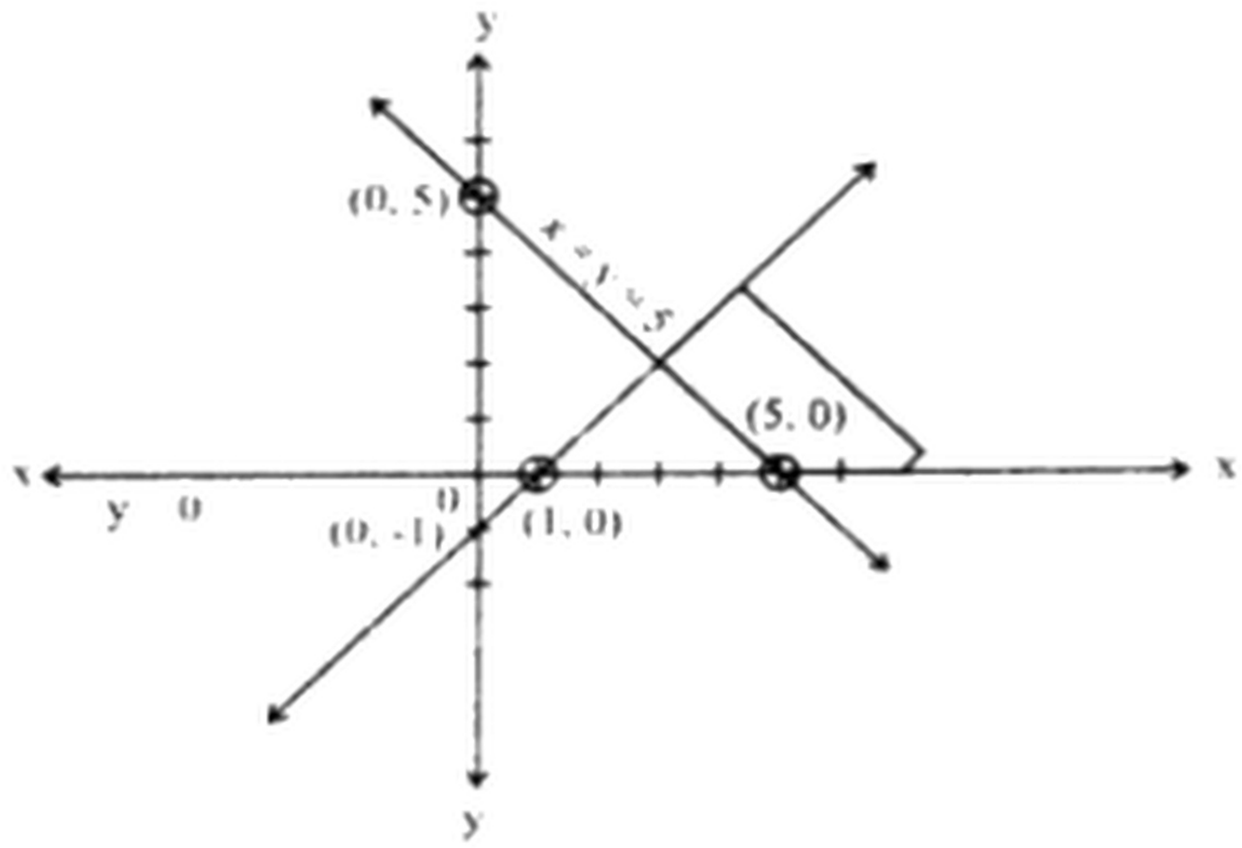
(1,0) is another point on (4)

putting $x = 0$, $y = 0$ in (2)

$0 - 0 < \mathbf{1}$

$0 < 1$

Which is false



(iv) $3x+7y \leq 21$, $x - y \leq 2$, $x \geq 0$

$3x + 7y \geq 21$ _____(1)

$3x + 7y = 21$ _____(3)

Putting $x = 0$ in (3)

$0 + 7y = 21 \Rightarrow y = 3$

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

$3x + 0 = 21 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 21$

$0 > 21$

Which is true

The graph is

$x - y \leq 2$ _____(2)

$x - y = 2$ _____(4")

Putting $x = 0$ in (4)

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

$\therefore$ (0,-2) is a point on (4)

Putting $y = 0$ in (4)

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

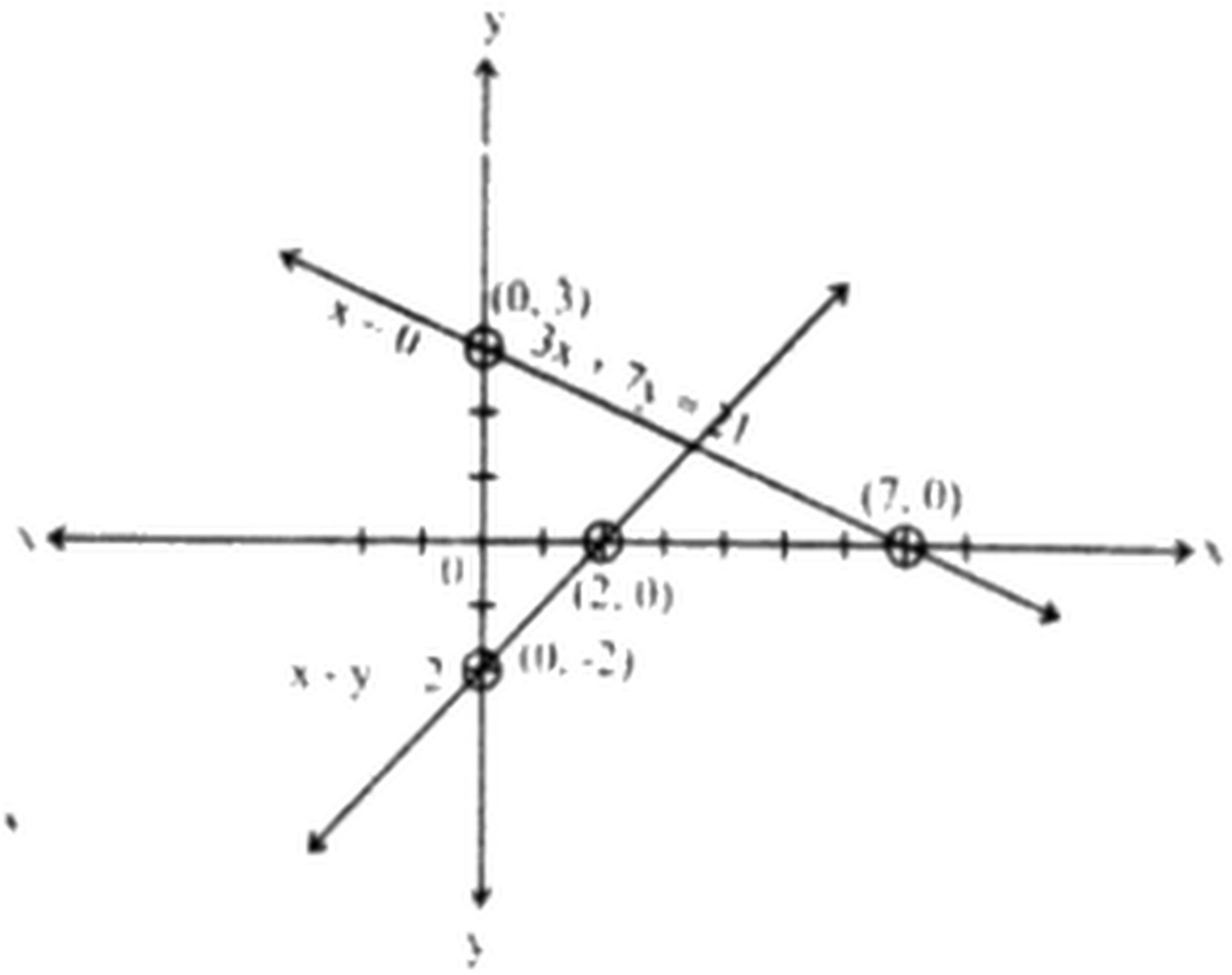
$\therefore$ (2, 0) is a point on (4)

Putting $x = 0, y = 0$ in (2)

$0 - 0 < 2$

$0 < 2$

Which is true



(v) $3x+7y \leq 21$, $x - y \leq 2$, $y \geq 0$

$3x + 7y \geq 21$ _____(1)

$3x + 7y = 21$ _____(3)

Putting $x = 0$ in (3)

$0 + 7y = 21 \Rightarrow y = 3$

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

$3x + 0 = 21 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 21$

$0 > 21$

Which is true

$x - y \leq 2$ _____(2)

$x - y = 2$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0,-2) is a point on (4)

Putting $y = 0$ in (4)

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

$\therefore$ (2, 0) is a point on (4)

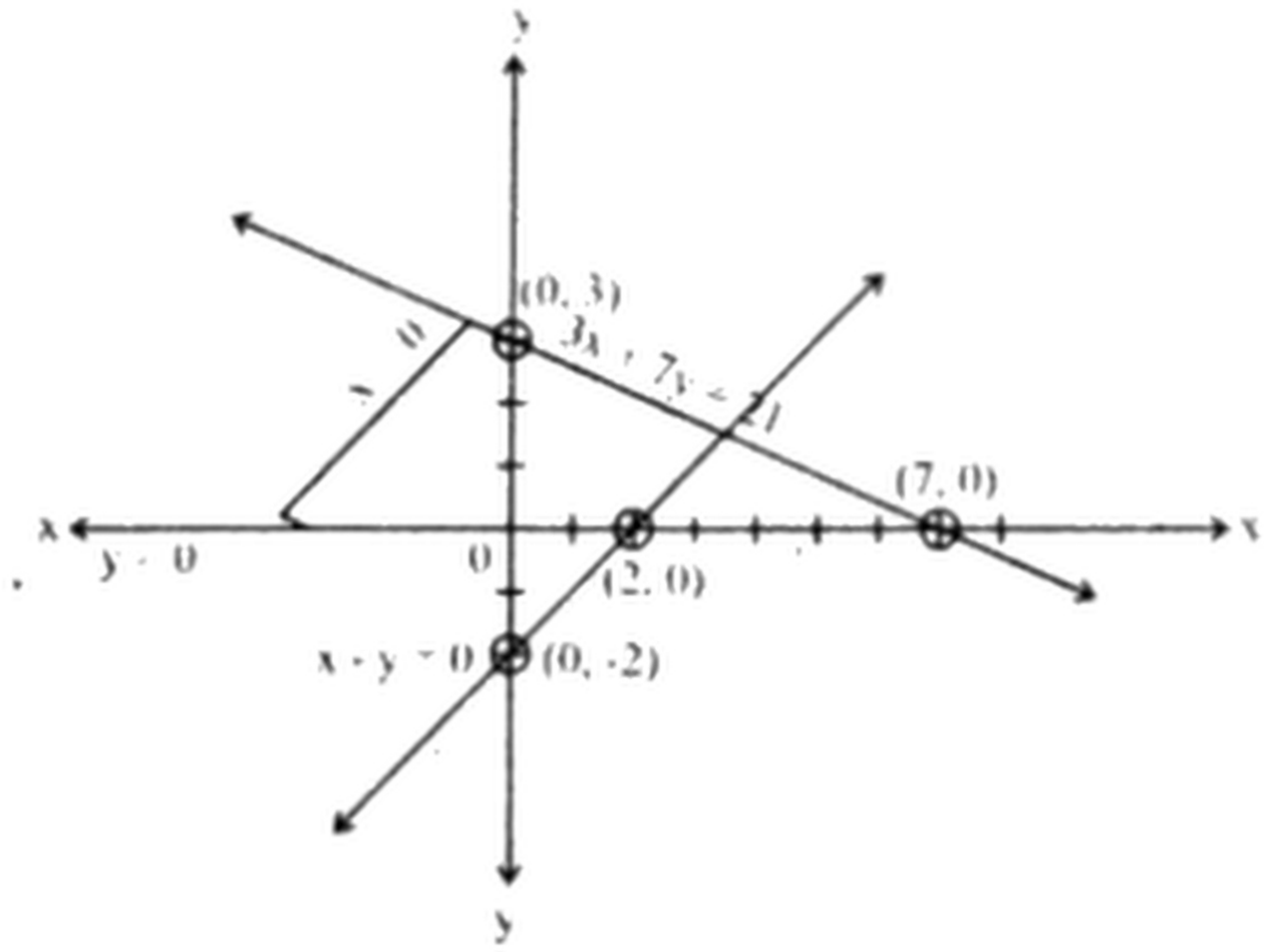
Putting $x = 0, y = 0$ in (2)

$0 - 0 < 2$

$0 < 2$

Which is true

The graph is



(vi) $3x+7y \leq 21, 2x - y \geq -3, x \geq 0$

$3x + 7y \leq 21$ _____(1)

$3x + 7y = 21$ _____(3)

Putting $x = 0$ in (3)

$0 + 7y = 21 \Rightarrow y = 3$

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

$3x + 0 = 21 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 21$

$0 > 21$

$2x - y \geq -3$ _____(2)

$2x - y = -3$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0,3) is a point on (4)

Putting $y = 0$ in (4)

$2x - 0 = 2-3 \Rightarrow x = \frac{-3}{2} = -1.5$

$\therefore$ $(-\frac{3}{2}-, 0)$ is a point on (4)

Putting $x = 0, y = 0$ in (2)

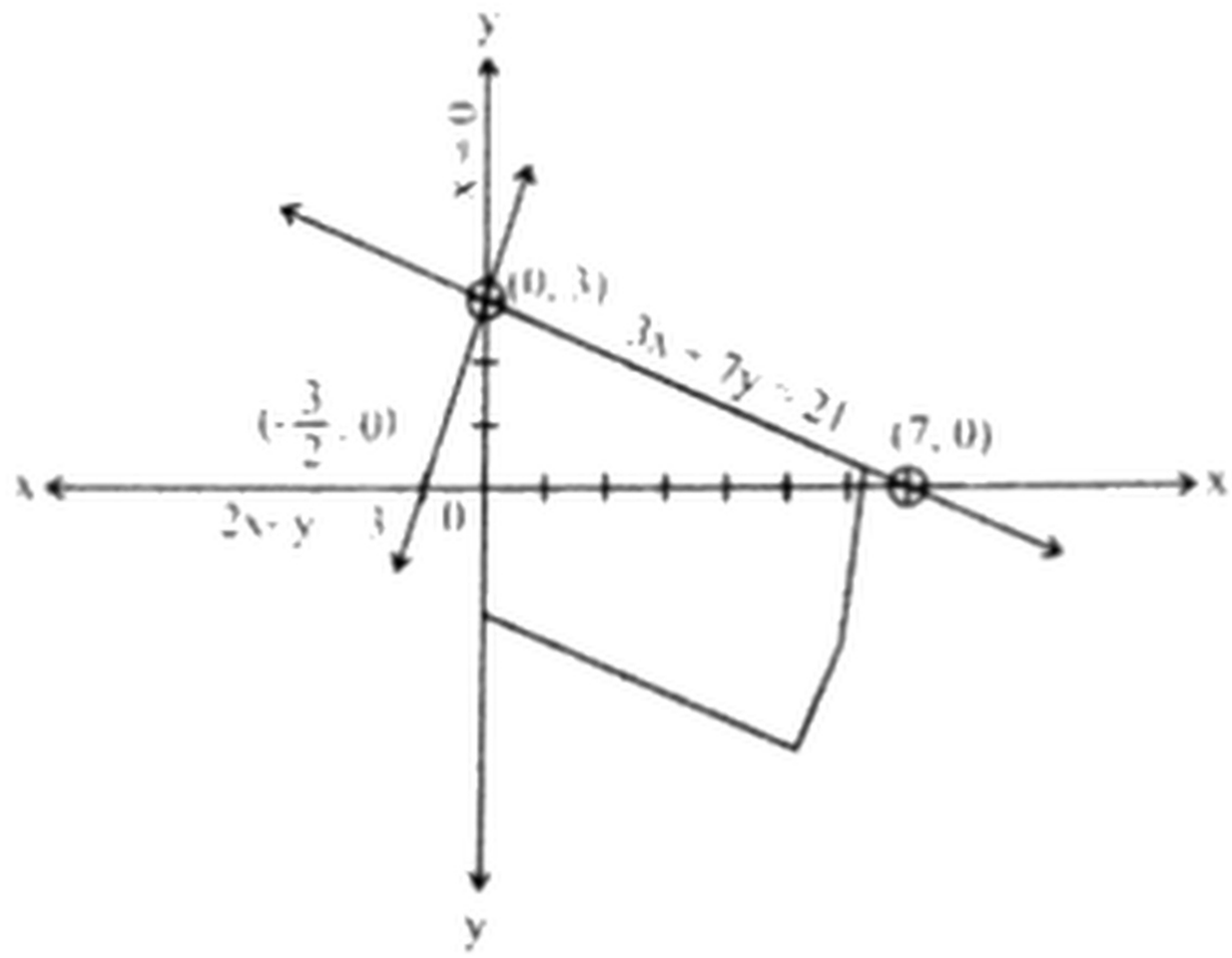
$0 - 0 < 3$

$0 < 3$

Which is true

The graph is

Which is true



Q4. Graph the solution region of the following systems of linear inequalities and find the corner points in each case:

Solution

(i) $2x-3y \leq 6$, $2x+3y \leq 12$, $x \geq 0$

$2x-3y \leq 6$ _____(1)

$3x+7y = 6$ _____(3)

Putting $x = 0$ in (3)

$0-3y = 6 \Rightarrow y = -2$

$\therefore$ (0,-2) is a point on (3)

Putting $y = 0$ in (3)

$2x-0 = 6 \Rightarrow x = 3$

$2x+3y \leq 12$_____(2)

$2x+3y = 12$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0,4) is a point on (4)

Putting $y = 0$ in (4)

$2x+0 = 12 \Rightarrow x = 6$

∴ (7,0) is a point on (3)

Putting x = 0, y = 0 in (1)

$0 - 0 < 21$

$0 > 21$

Which is true

∴ (6, 0) is a point on (4)

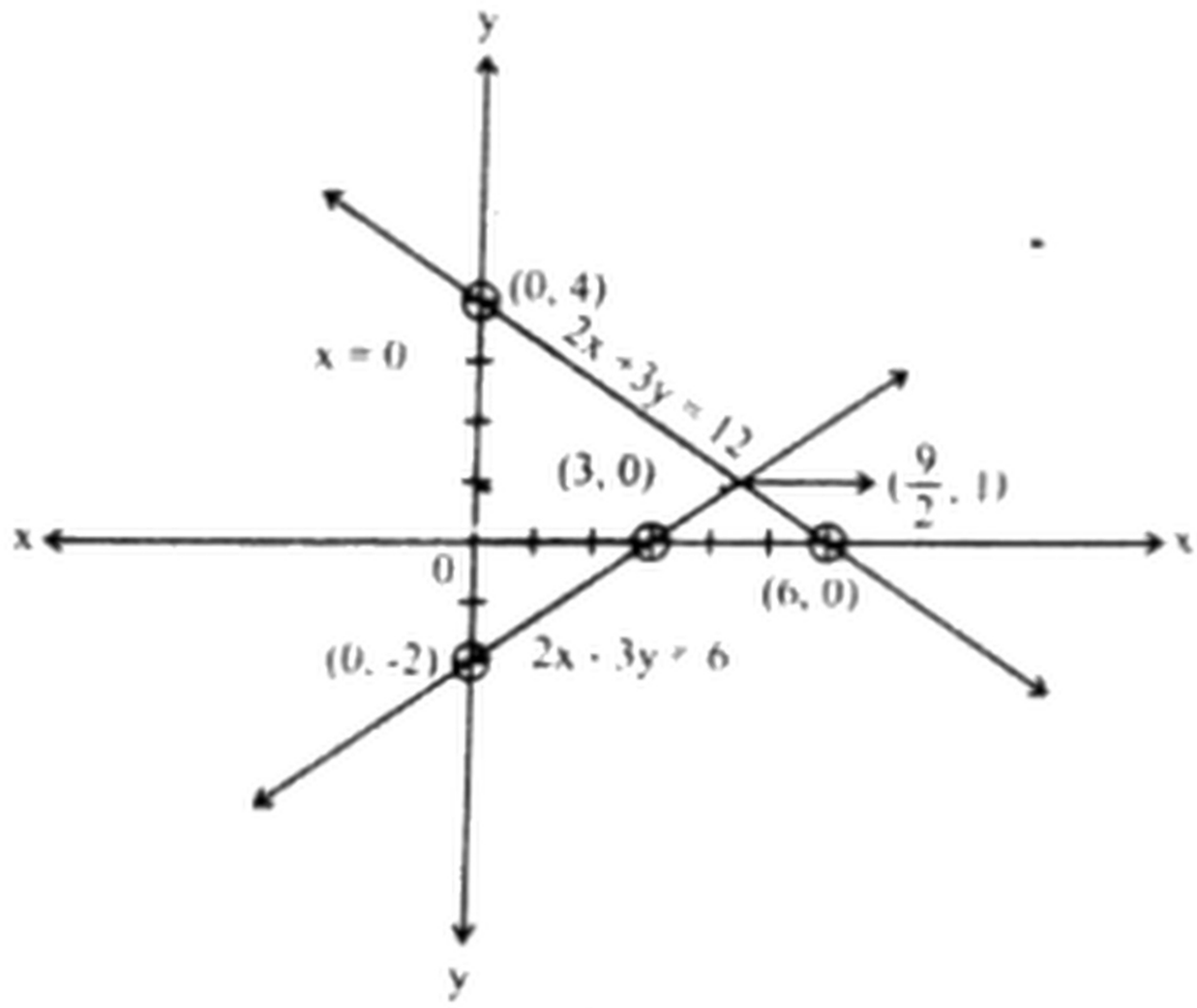
Putting x = 0, y = 0 in (2)

$0 + 0 < 12$

$0 < 12$

Which is true

The graph is



Solving (3) and (4)

Putting $x = \frac{9}{2}$ in (3)

$$\begin{array}{r} 2x - 3y = 6 \\ 2x + 3y = 12 \\ \hline 4x = 18 \end{array}$$

$$X = \frac{18}{4} = \frac{9}{2}$$

$2(\frac{9}{2}) - 3y = 6$

$-3y = -3$

∴ $y = 1$

Hence $\left(\frac{9}{2}, 1\right)$, (0,4) and (0,-2) are the corner points.

(ii) $x + y \leq 5, 2 - 2x + y \leq 2, y \geq 0$

$x + y \leq 5$ _____(1)

$x + y = 5$ _____(3)

Putting $x = 0$ in (3)

$0 + y = 5 \Rightarrow y = 5$

$\therefore$ (0,5) is a point on (3)

Putting $y = 0$ in (3)

$x + 0 = 5 \Rightarrow x = 5$

$\therefore$ (5,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 5$

$0 > 5$

Which is true

$-2x + y \leq$ _____(2)

$-x + y = 2$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0,2) is a point on (4)

Putting $y = 0$ in (4)

$-2x + 0 = 2 \Rightarrow x = -1$

$\therefore$ $(-1, 0)$ is a point on (4)

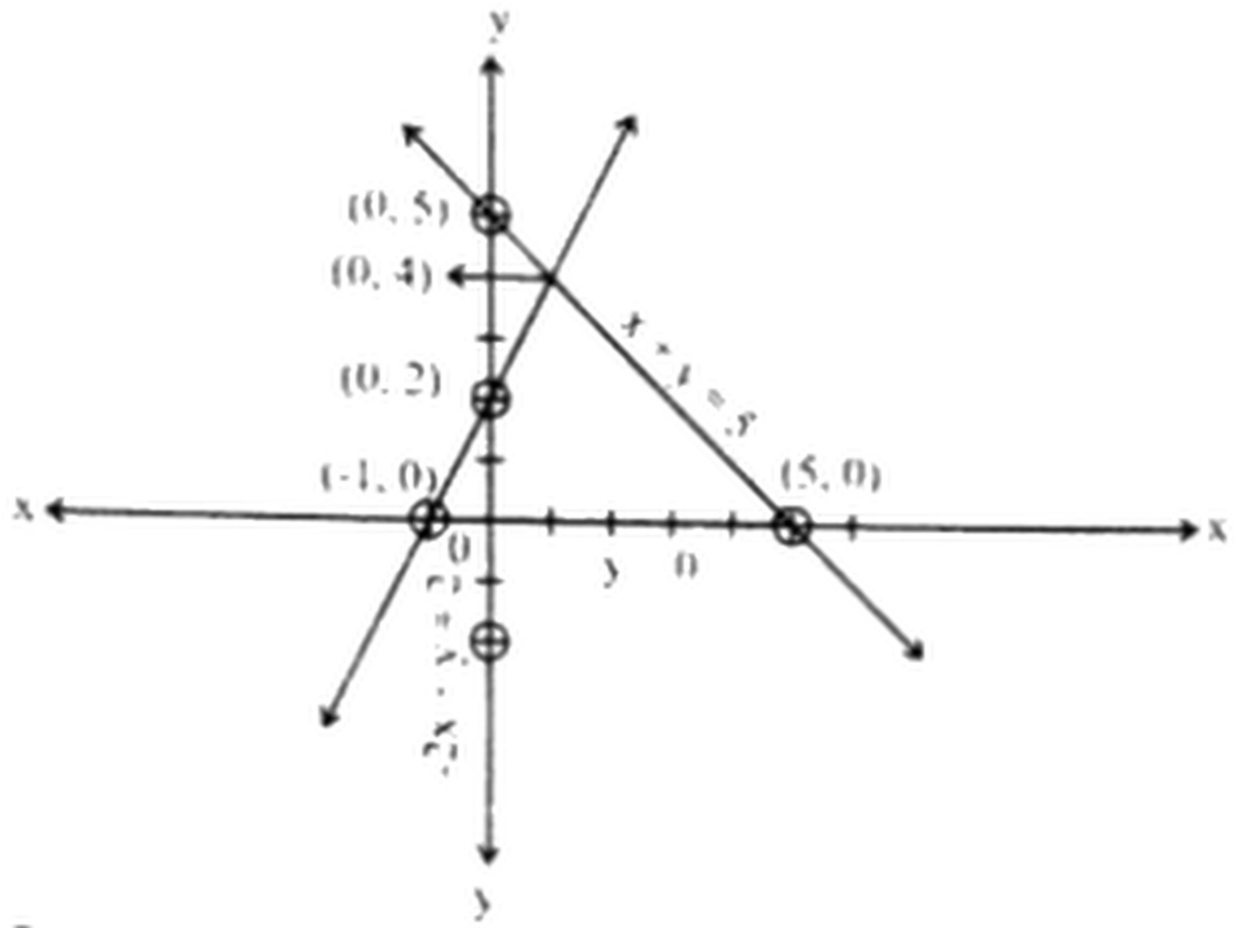
Putting $x = 0, y = 0$ in (2)

$0 + 0 < 2$

$0 < 2$

Which is true

The graph is



(iii) $3x+7y \leq 21, 2x - y \leq -3, y \geq 0$

$3x + 7y \leq 21$ _____(1)

$3x + 7y = 21$ _____(3)

Putting $x = 0$ in (3)

$0 + 7y = 21 \Rightarrow y = 3$

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

$3x + 0 = 21 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 21$

$0 > 21$

Which is true

$2x - y \leq -3$ _____(2)

$x - y = -3$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0,3) is a point on (4)

Putting $y = 0$ in (4)

$2x - 0 = 2-3 \Rightarrow x = \frac{-3}{2} = -1.5$

$\therefore$ $(-\frac{3}{2}-, 0)$ is a point on (4)

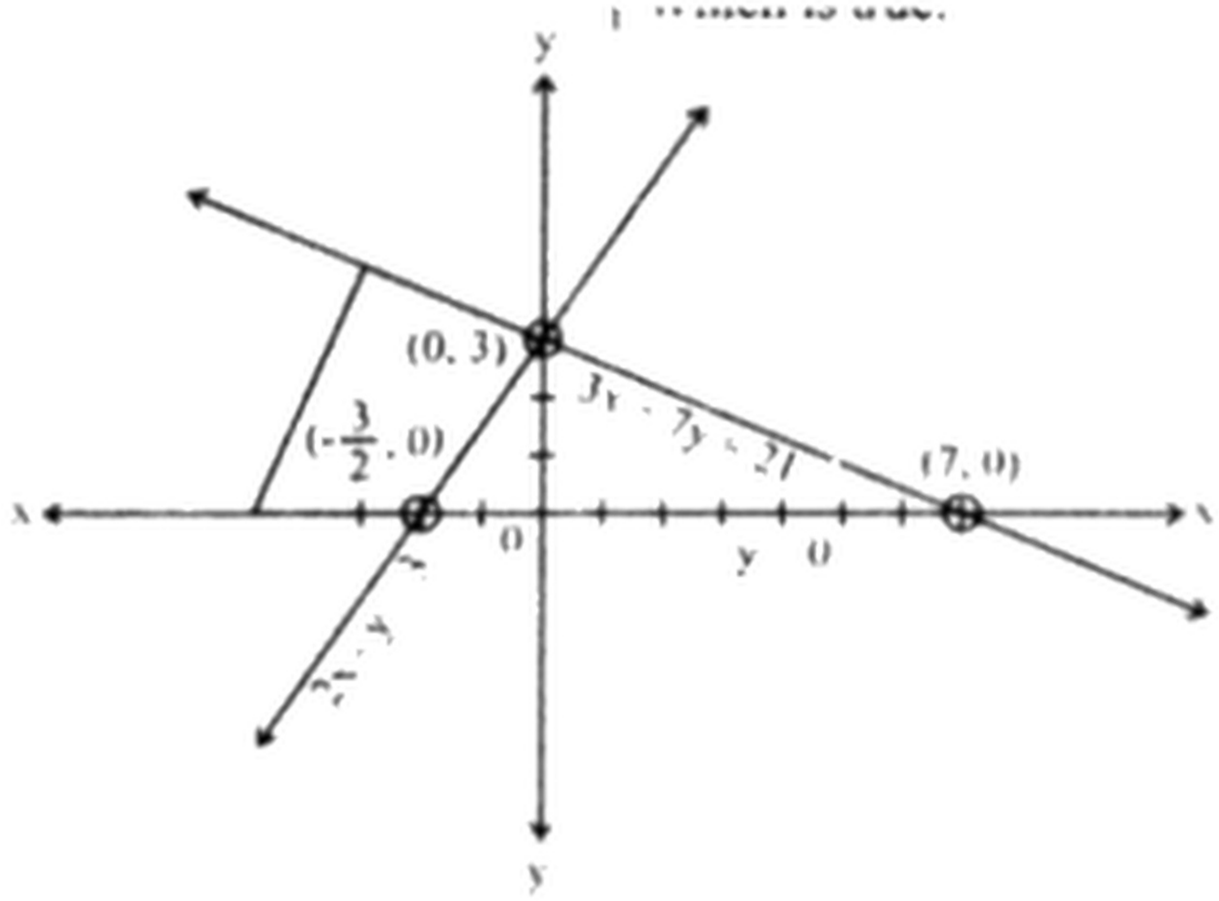
Putting $x = 0, y = 0$ in (2)

$0 - 0 < -3$

$0 < -3$

Which is true

Hence $(\frac{-3}{2}, 0)$ and (0,3) are the corner points.



(iv) $3x+2y \geq 6$, $2x+3y \leq 6$, $y \geq 0$

$3x+7y \geq 6$ _____(1)

$3x+7y = 6$ _____(3)

Putting $x = 0$ in (3)

$0+2y = 6 \Rightarrow y = 3$

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

$3x + 0 = 6 \Rightarrow x = 2$

$\therefore$ (2,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 > 6$

$0 > 6$

Which is true

From (4)

$x + 6 - 3y$ _____(5)

$x+3y \leq 6$ _____(2)

$x+3y = 6$ _____(4)

Putting $x = 0$ in (4)

$0+3y = 6 \Rightarrow y = 2$

$\therefore$ (0,2) is a point on (4)

Putting $y = 0$ in (4)

$x+0 = 6 \Rightarrow x = 6$

$\therefore$ (6, 0) is a point on (4)

Putting $x = 0, y = 0$ in (2)

$0+0 < 6$

$0 < 6$

Which is true

Putting (5) in (3)

$3(6-3y) + 2y = 6$

$18 - 9y + 2y = 6$

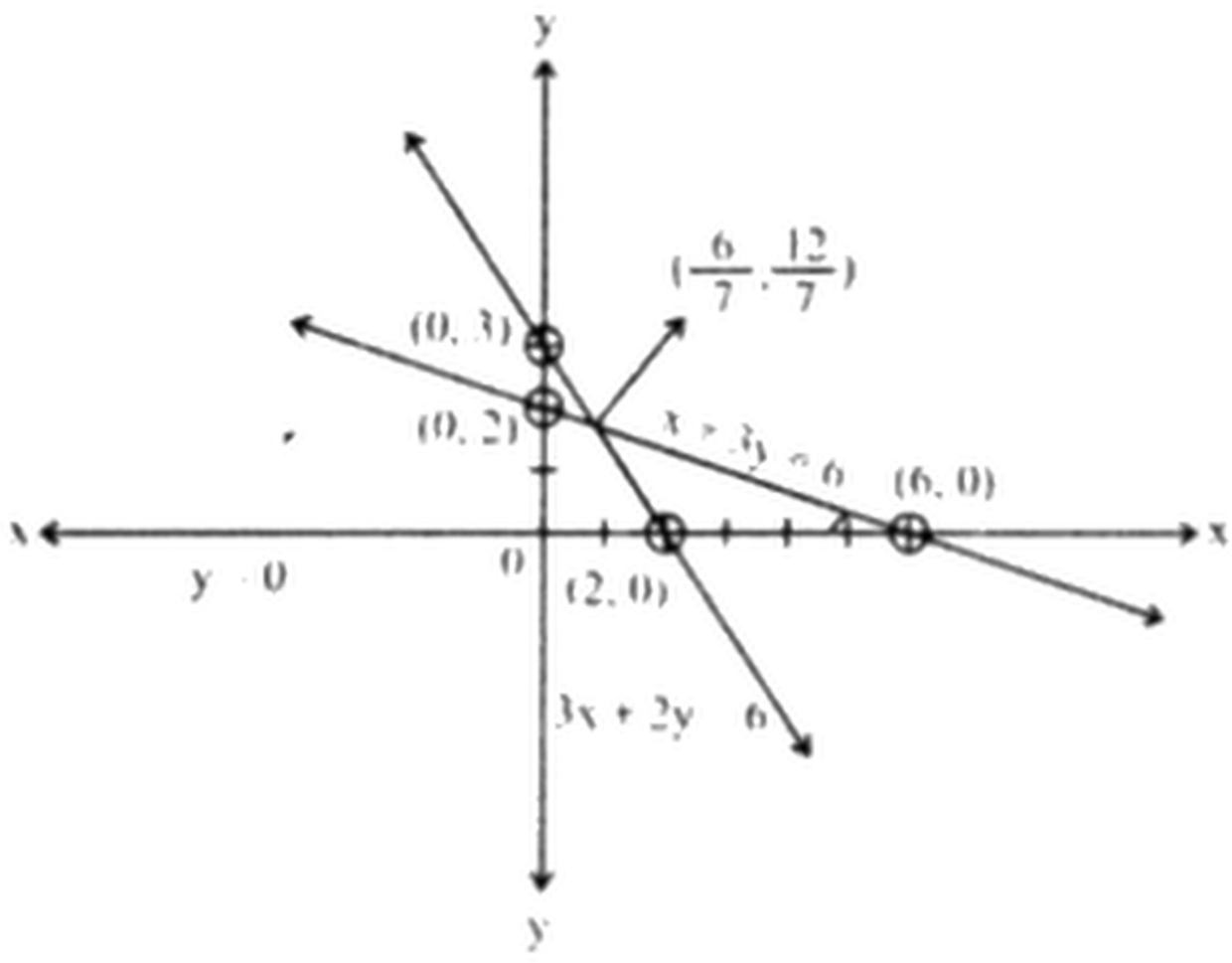
$- 7y = -12$

$- y = \frac{12}{7}$

Putting $y = \frac{12}{7}$ in (5)

$X = 6 - 3(\frac{12}{7}) = 6 - \frac{12}{7} = \frac{42-36}{7} = \frac{6}{7}$

Hence $(\frac{12}{7}, \frac{6}{7})$, (2,0) and (6,0) are the corner points



(v) $5x+7y \leq 35$, $-x+3y \leq 3$, $x \geq 0$

$5x + 7y \leq 35$ _____(1)

$5x + 7y = 35$ _____(3)

Putting x = 0 in (3)

$0 + 7y = 35 \Rightarrow y = 5$

$\therefore$ (0,5) is a point on (3)

Putting y = 0 in (3)

$-x + 3y \leq 3$ _____(2)

$-x + 3y = 6$ _____(4)

Putting x = 0 in (4)

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

$\therefore$ (0,1) is a point on (4)

Putting y = 0 in (4)

$5x + 0 = 35 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting x = 0, y = 0 in (1)

$0 + 0 < 35$

$0 < 35$

Which is true

From (4)

$-x = 3 - 3y$

$x = 3y - 3$ _____(5)

Putting $y = \frac{25}{11}$ in (5)

$X = 3(\frac{25}{11}) - 3 = \frac{25}{11} - 3 = \frac{75-33}{11} = \frac{42}{11}$

Hence $(\frac{4}{11}, \frac{25}{1})$, (0,1) are the corner points

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

$\therefore$ (−3, 0) is a point on (4)

Putting x = 0, y = 0 in (2)

$-0 + 0 < 3$

$0 < 3$

Which is true

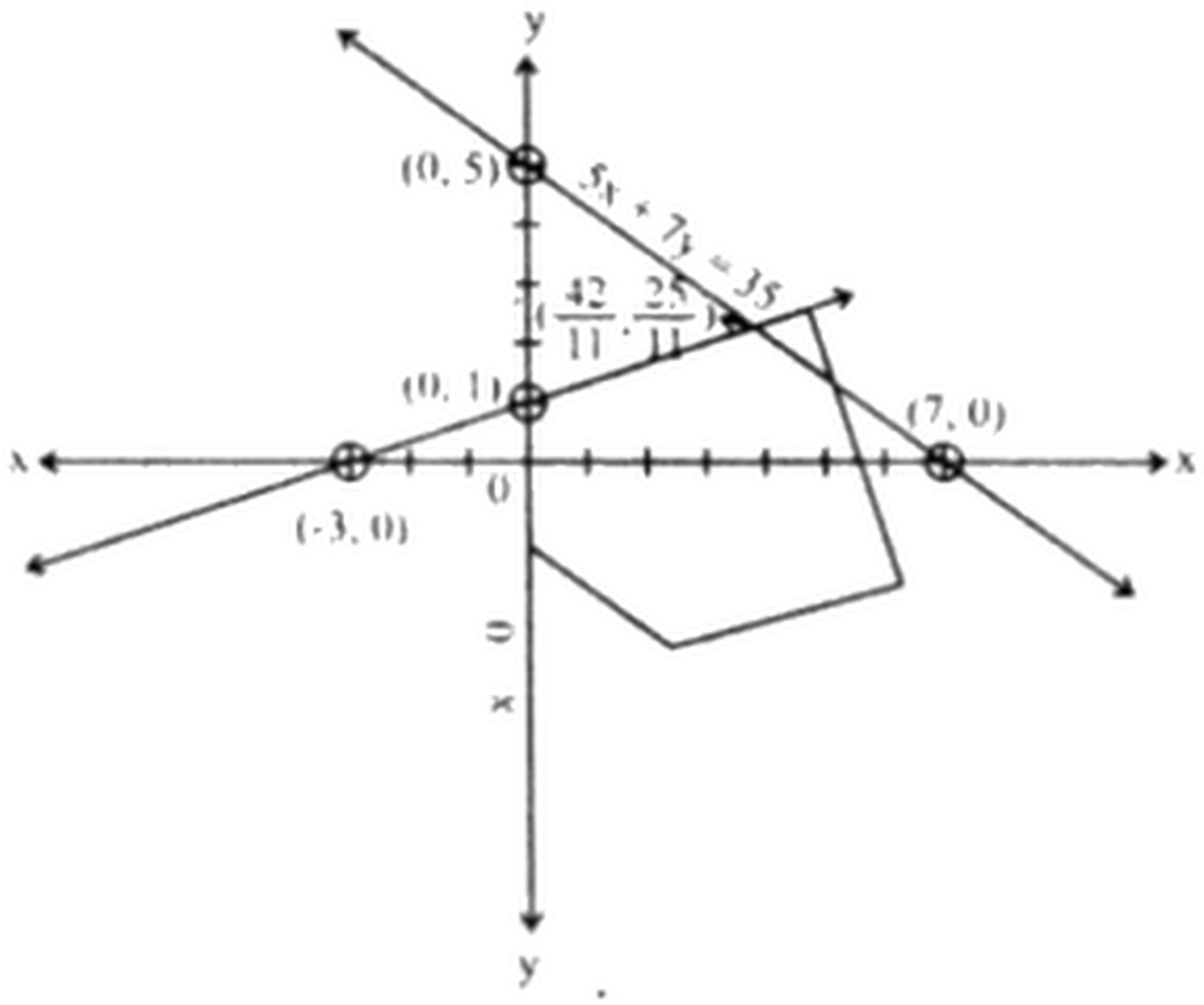
Putting (5) in (3)

$5(3y - 3) + 7y = 35$

$15y - 15 + 7y = 35$

$22y = 50$

$y = \frac{25}{11}$



(vi) $5x+7y \leq 35$, $x - 2y \leq 4$, $x \geq 0$

$5x + 7y \leq 35$ _____(1)

$5x + 7y = 35$ _____(3)

Putting $x = 0$ in (3)

$0 + 7y = 35 \Rightarrow y = 5$

$\therefore$ (0,5) is a point on (3)

Putting $y = 0$ in (3)

$5x + 0 = 35 \Rightarrow x = 7$

$\therefore$ (7,0) is a point on (3)

Putting $x = 0$, $y = 0$ in (1)

$0 + 0 < 35$

$0 < 35$

Which is true

$x - 2y \leq 4$ _____(2)

$x - 2y = 4$ _____(4)

Putting $x = 0$ in (4)

$0 - 2y = 4 \Rightarrow y = -2$

$\therefore$ (0,-2) is a point on (4)

Putting $y = 0$ in (4)

$x - 0 = 4 \Rightarrow x = 4$

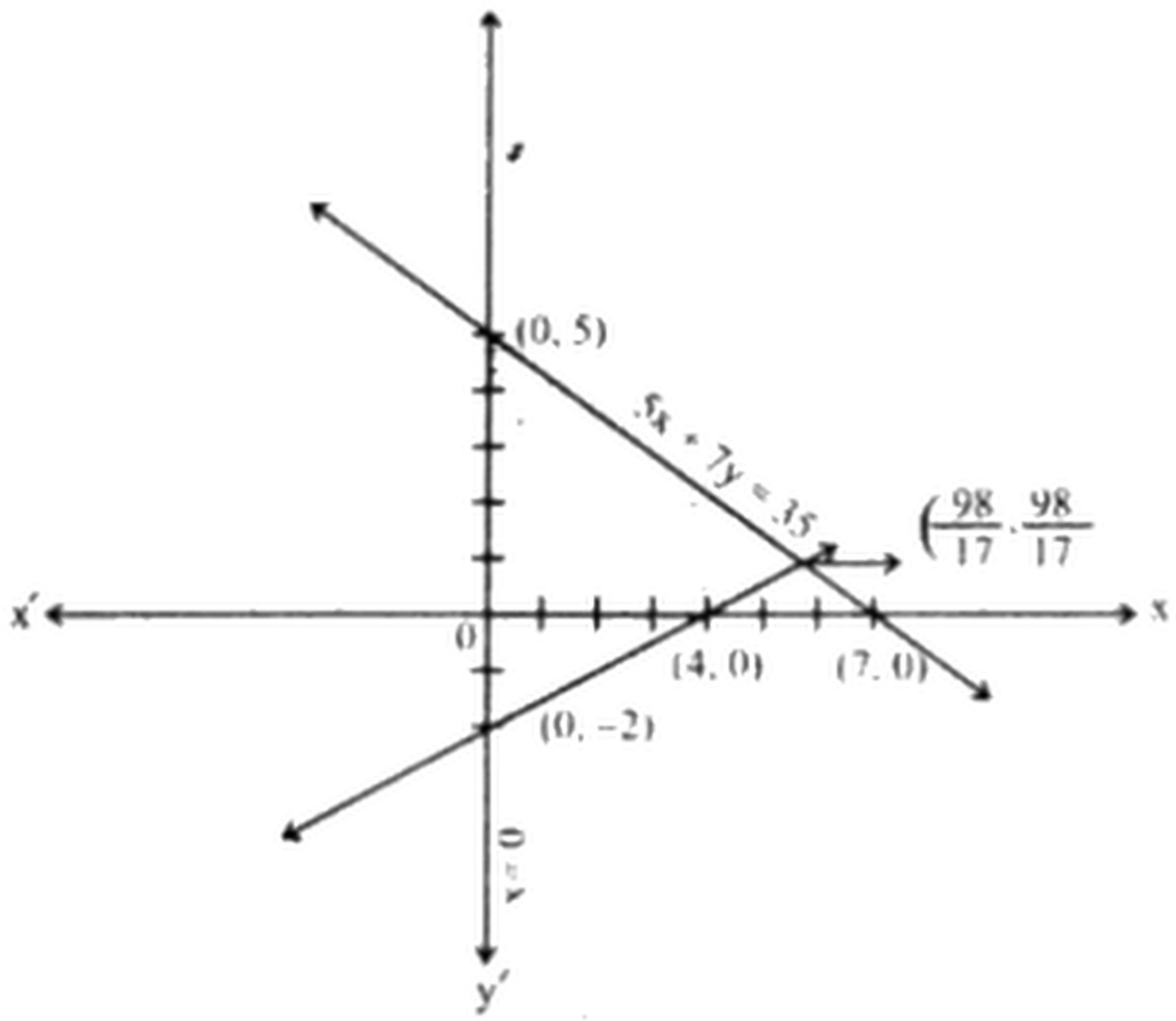
$\therefore$ (4, 0) is a point on (4)

Putting $x = 0$, $y = 0$ in (2)

$0 - 0 < 4$

$0 < 4$

Which is true



From (4)

$x = 4 + y$

Putting (5) in (3)

$5(4+2y) + 7y = 35$

$20 + 10y + 7y = 35$

$17y = 15$

$y = \frac{15}{17}$

Putting $y = \frac{15}{17}$ in (5)

$x = 4 + 2(\frac{15}{17}) = 3 + \frac{30}{17} = \frac{68+30}{17} = \frac{98}{17}$

Hence $(\frac{98}{17}, \frac{15}{17})$, (0,5) and (0,-2) are the corner points

Q5 Graph the solution region of the following system of linear inequalities by shading.

Solution

(i) $3x-4y \leq 12$, $3x+2y \geq 3$, $x+2y \leq 9$

$3x-4y \leq 12$ _____(1)

$3x-y = 12$ _____(3)

Putting $x = 0$ in (3)

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

$\therefore$ (0,3) is a point on (3)

Putting $y = 0$ in (3)

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

$\therefore$ (4,0) is a point on (3)

Putting $x= 0$, $y = 0$ in (1)

$0 - 0 < 12$

$0 < 12$

Which is true

$3x+2y \geq 3$ _____(2)

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

Putting $x = 0$ in (4)

$0+2y = 3 \Rightarrow y = \frac{3}{2} = 1.5$

$\therefore$ $(0, \frac{3}{2})$ is a point on (4)

Putting $y = 0$ in (4)

$3x+0 = 3 \Rightarrow x = 1$

$\therefore$ (1, 0) is a point on (4)

Putting $x = 0$, $y = 0$ in (2)

$-0+0 > 3$

$0 > 3$

Which is false

$x+2y \leq 9$ _____(5)

$x + 2y = 9$ _____(6)

Putting $x =0$ in (6)

$0+2y = 9 \Rightarrow y = \frac{9}{2} = 4.5$

$(0, \frac{9}{2})$ is a point on (6)

Putting $y = 0$ in (6)

$x + 0 = 9 \Rightarrow x = 9$

(9,0) is another point on (6)

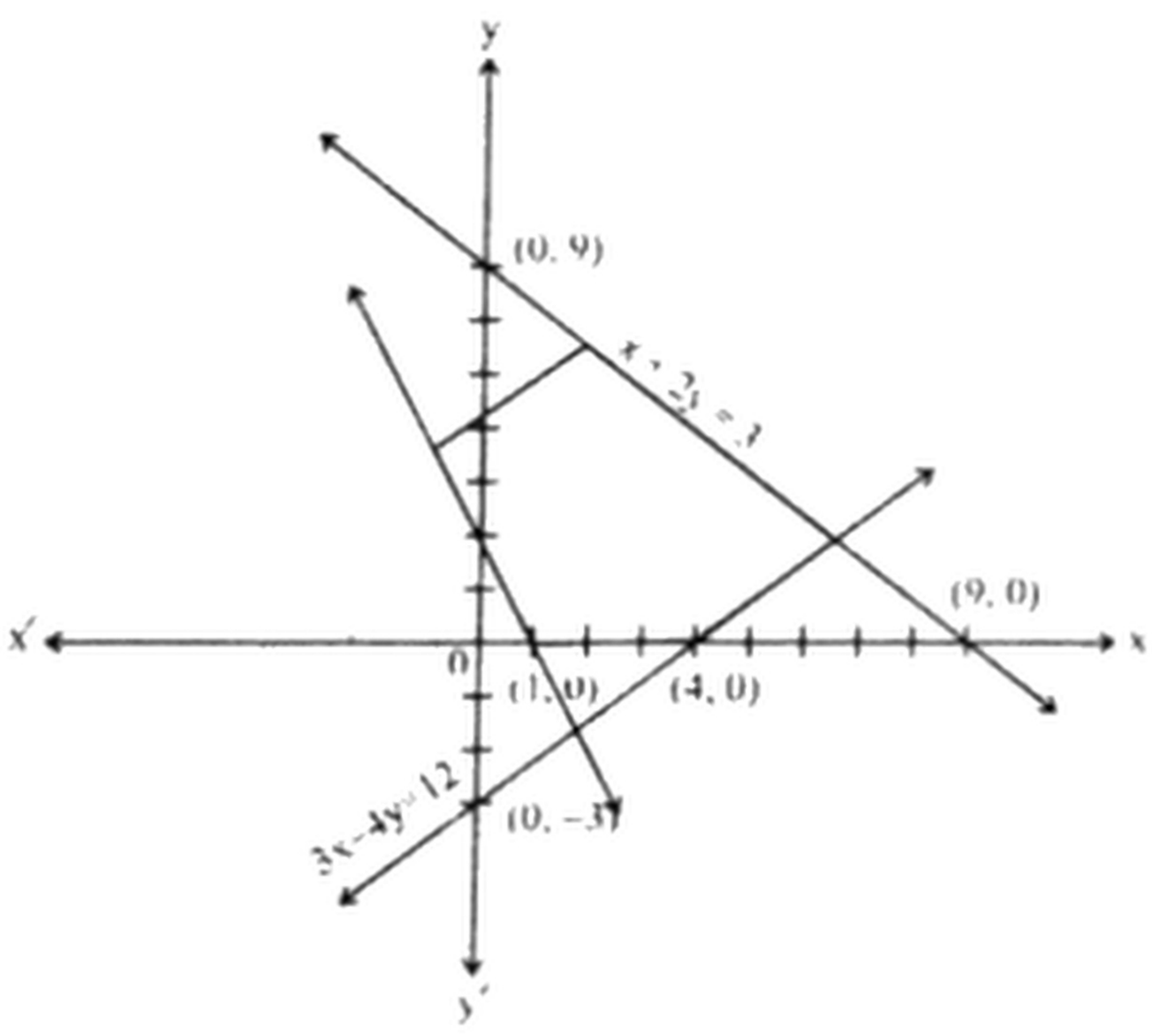
Putting $x = 0$, $y = 0$ in (5)

$0 + 0 < 9$

$0 < 9$

Which is true

The graph is



(ii) $3x-4y \leq 12$, $x+2y \leq 6$, $x+y \geq 1$

$3x-4y \leq 12$ _____(1)

$3x-4y = 12$ _____(3)

Putting $x = 0$ in (3)

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

$\therefore$ (0,-3) is a point on (3)

Putting $y = 0$ in (3)

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

$x+2y \leq 6$ _____(2)

$x+2y = 6$ _____(4)

Putting $x = 0$ in (4)

$0+2y = 6 \Rightarrow y = 3$

$\therefore$ (0, −3) is a point on (4)

Putting $y = 0$ in (4)

$x+0 = 6 \Rightarrow x = 6$

∴ (4,0) is a point on (3)

Putting x = 0, y = 0 in (1)

$0 - 0 < 12$

$0 < 12$

Which is true

$x + y \geq 1$ _____(5)

$x + y = 9$ _____(6)

Putting x =0 in (6)

$0 + y = 1 \Rightarrow y = 1$

(0, 1) is a point on (6)

Putting y = 0 in (6)

$x + 0 = 1 \Rightarrow x = 1$

(1,0) is another point on (6)

Putting x = 0 , y = 0 in (5)

$0 + 0 > 1$

$0 > 1$

Which is false

The graph is

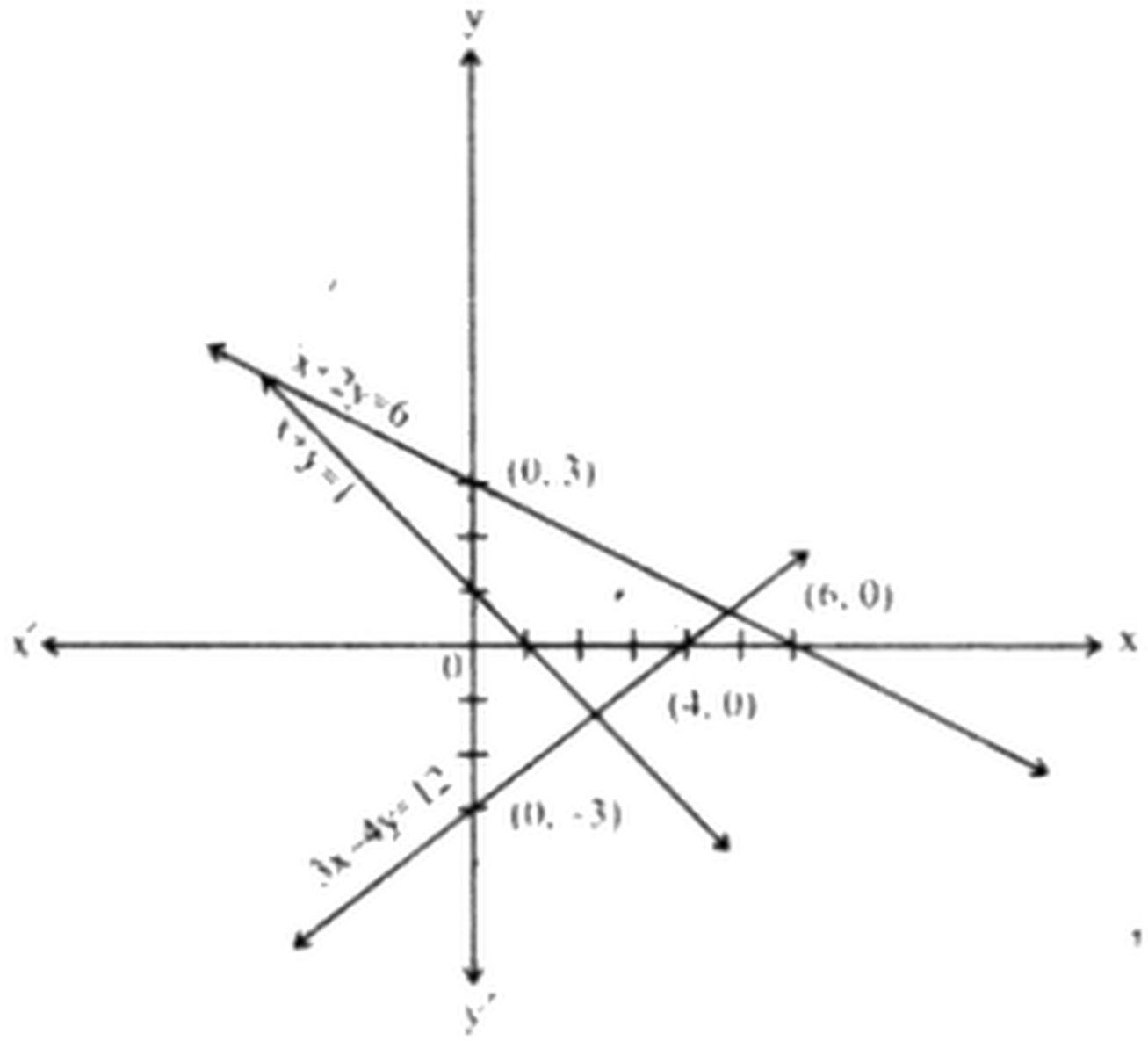
∴ (6, 0) is a point on (4)

Putting x= 0, y = 0 in (2)

$-0 + 0 < 6$

$0 < 6$

Which is false



(iii) $2x+y \leq 4$, $2x-3y \geq 12$, $x+2y \leq 6$

$2x+y \leq 4$ _____(1)

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

Putting $x = 0$ in (3)

$0+y = 4 \Rightarrow y = 4$

$\therefore$ (0,4) is a point on (3)

Putting $y = 0$ in (3)

$2x + 0 = 4 \Rightarrow x = 2$

$\therefore$ (2,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0+0 < 4$

$0 < 4$

$2x-3y \geq 12$ _____(2)

$2x-3y = 12$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0, 4) is a point on (4)

Putting $y = 0$ in (4)

$2x-0 = 12 \Rightarrow x = 6$

$\therefore$ (6, 0) is a point on (4)

Putting $x = 0, y = 0$ in (2)

$0-0 > 12$

$0 > 12$

Which is true

$x + 2y \leq 6$ _____(5)

$x + 2y = 6$ _____(6)

Putting $x = 0$ in (6)

$0 + 2y = 6 \Rightarrow y = 3$

(0, 3) is a point on (6)

Putting $y = 0$ in (6)

$x + 0 = 6 \Rightarrow x = 6$

(9,0) is another point on (6)

Putting $x = 0$, $y = 0$ in (5)

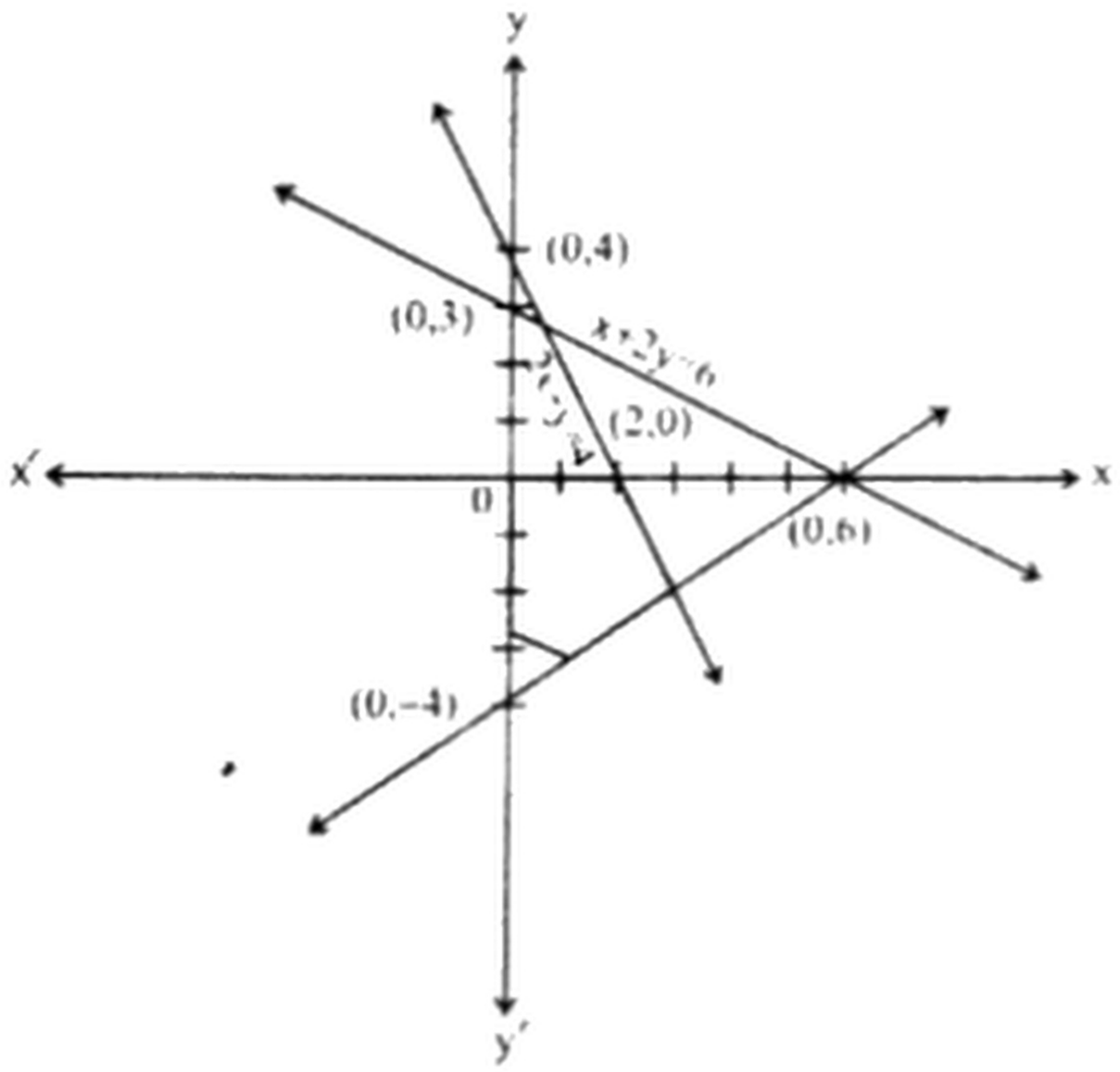
$0 + 0 < 6$

$0 < 6$

Which is true

The graph is

Which is false



(iv) $2x+y \leq 10$, $x+y \leq 7$, $-2x+y \leq 4$

$2x+y \leq 10$ _____(1)

$2x+y = 10$ _____(3)

Putting $x = 0$ in (3)

$0+y = 10 \Rightarrow y = 10$

$\therefore$ (0,10) is a point on (3)

Putting $y = 0$ in (3)

$2x + 0 = 10 \Rightarrow x = 5$

$\therefore$ (5,0) is a point on (3)

Putting $x = 0, y = 0$ in (1)

$0 + 0 < 10$

$0 < 10$

$x+y \leq 7$ _____(2)

$x+y = 7$ _____(4)

Putting $x = 0$ in (4)

$0+y = 7 \Rightarrow y = 7$

$\therefore$ (0, 7) is a point on (4)

Putting $y = 0$ in (4)

$x+0 = 7 \Rightarrow x = 7$

$\therefore$ (7, 0) is a point on (4)

Putting $x = 0, y = 0$ in (2)

$0+0 < 7$

$0 < 7$

Which is true

$-2x + y \leq 4$ _____(5)

$-2x + y = 4$ _____(6)

Putting x =0 in (6)

$-0 + y = 4 \Rightarrow y = 4$

(0, 4) is a point on (6)

Putting y = 0 in (6)

$-2x + 0 = 4 \Rightarrow x = -2$

(-2,0) is another point on (6)

Putting x = 0 , y = 0 in (5)

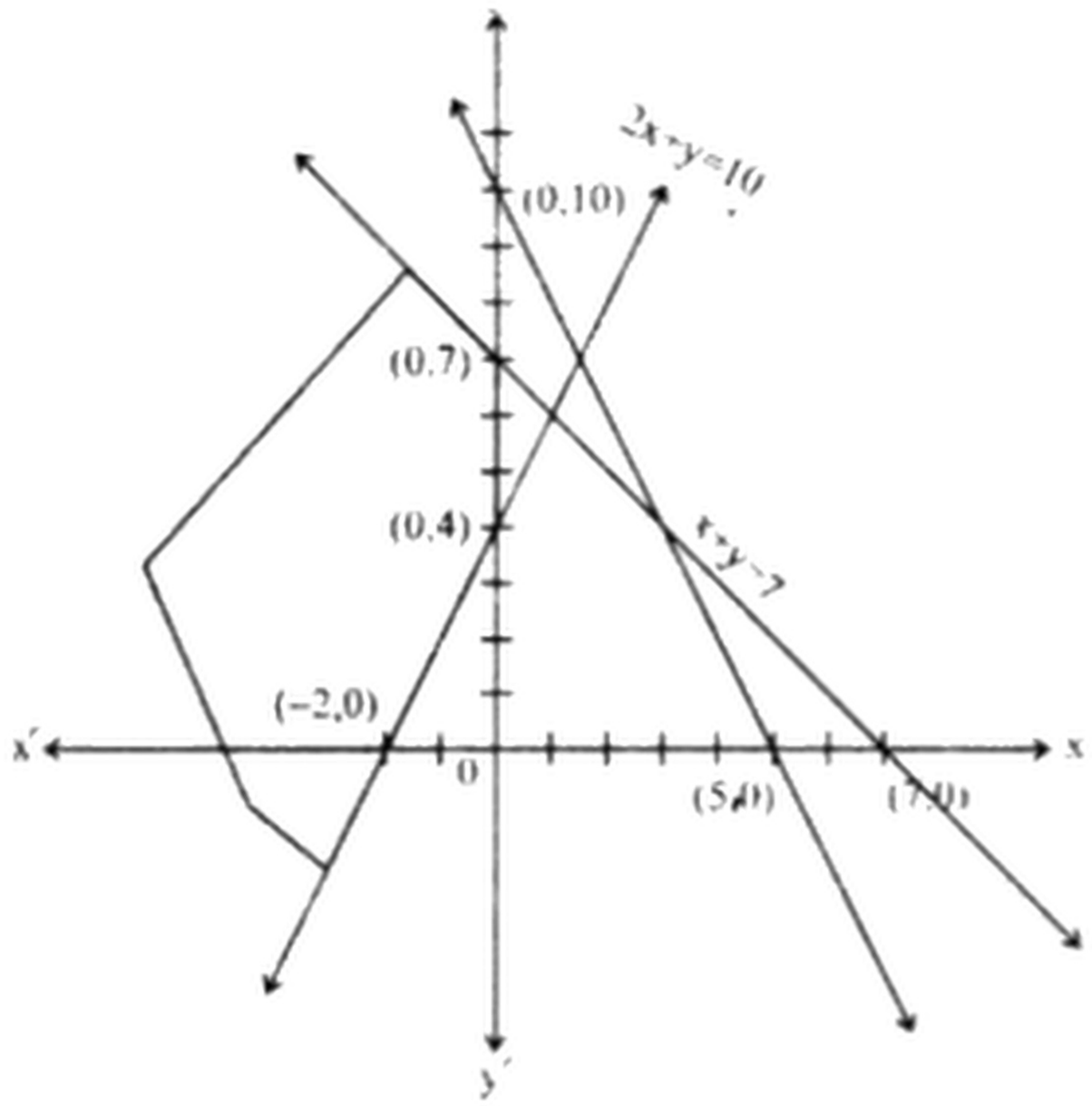
$-0 + 0 < 4$

$0 < 4$

Which is true

The graph is

Which is true



(v) $2x+3y \leq 18$, $2x+2y \leq 10$, $-2x+y \leq 2$

$2x+3y \leq 18$ _____(1)

$2x+3y = 18$ _____(3)

Putting $x = 0$ in (3)

$0+3y = 18 \Rightarrow y = 6$

$\therefore$ (0,6) is a point on (3)

Putting $y = 0$ in (3)

$0+3y = 18 \Rightarrow y = 6$

$\therefore$ (0,6) is a point on (3)

Putting $y = 0$, in (3)

$2x + 0 = 18 \Rightarrow x = 9$

(9,0) is another point on (3)

Putting $x = 0$, $y = 0$ in (1)

$2x+y \leq 10$ _____(2)

$2x+y = 10$ _____(4)

Putting $x = 0$ in (4)

$0+y = 10 \Rightarrow y = 10$

$\therefore$ (0, 10) is a point on (4)

Putting $y = 0$ in (4)

$0 + y = 10 \Rightarrow y = 10$

$\therefore$ (0,10) is a point on (4)

Putting $y = 0$ in (4)

$2x + 0 = 10 \Rightarrow x = 5$

(5,0) is a point on (4)

$0 + 0 < 18$

$0 < 18$

Which is true

$-2x + y \leq 2$ _____(5)

$-2x + y = 2$ _____(6)

Putting $x = 0$ in (6)

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

$(0, 2)$ is a point on (6)

Putting $y = 0$ in (6)

$-2 + 0 = 2 \Rightarrow x = -1$

$(-1, 0)$ is another point on (6)

Putting $x = 0$, $y = 0$ in (5)

$-0 + 0 < 2$

$0 < 2$

Which is true

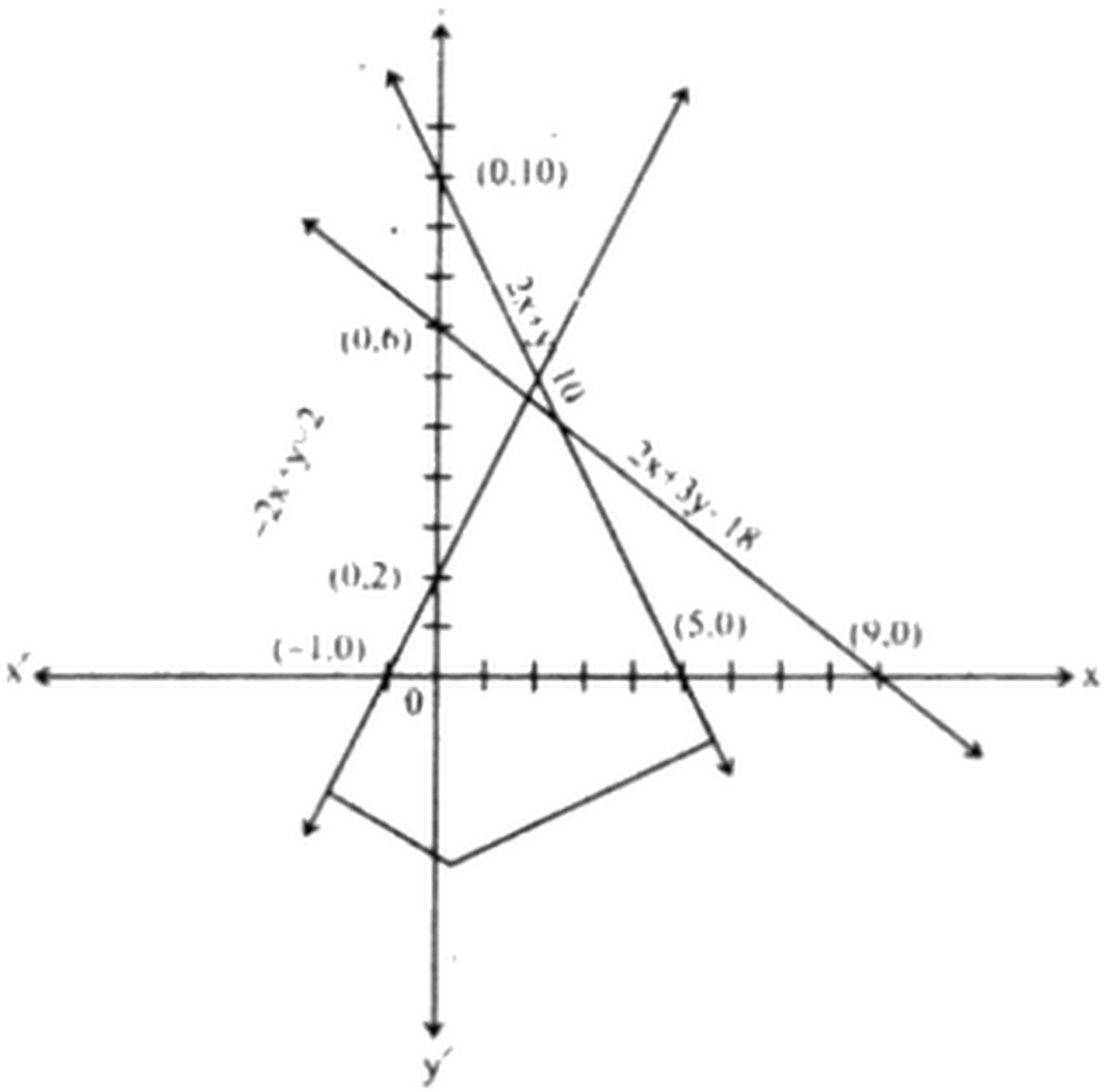
The graph is

Putting $x = 0, y = 0$ in (2)

$0 + 0 < 10$

$0 < 3$

Which is true



(vi) $3x-2y \geq 3$, $x+4y \leq 12$, $3x+y \leq 12$

$3x-2y \geq 3$ _____(1)

$3x-2y = 3$ _____(3)

Putting $x = 0$ in (3)

$0-2y = 3 \Rightarrow y = \frac{-3}{2} = -1.5$

$\therefore$ $(0, \frac{-3}{2})$ is a point on (3)

Putting $y = 0$ in (3)

$3x - 0 = 3 \Rightarrow x = 1$

$\therefore$ (1,0) is a point on (3)

Putting $x = 0$, $y = 0$ in (1)

$x+4y \leq 12$ _____(2)

$x+4y = 12$ _____(4)

Putting $x = 0$ in (4)

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

$\therefore$ (0, 3) is a point on (4)

Putting $y = 0$ in (4)

$x+0 = 12 \Rightarrow x = 12$

$\therefore$ (12, 0) is a point on (4)

Putting $x = 0$, $y = 0$ in (2)

$0 - 0 > 3$

$0 > 3$

Which is false

$0 + 0 < 12$

$0 < 12$

Which is true

$3x + y \leq 12$ _____(5)

$3x + y = 12$_____(6)

Putting $x = 0$ in (6)

$0 + y = 12 \Rightarrow y = 12$

$(0, 12)$ is a point on (6)

Putting $y = 0$ in (6)

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

(4,0) is another point on (6)

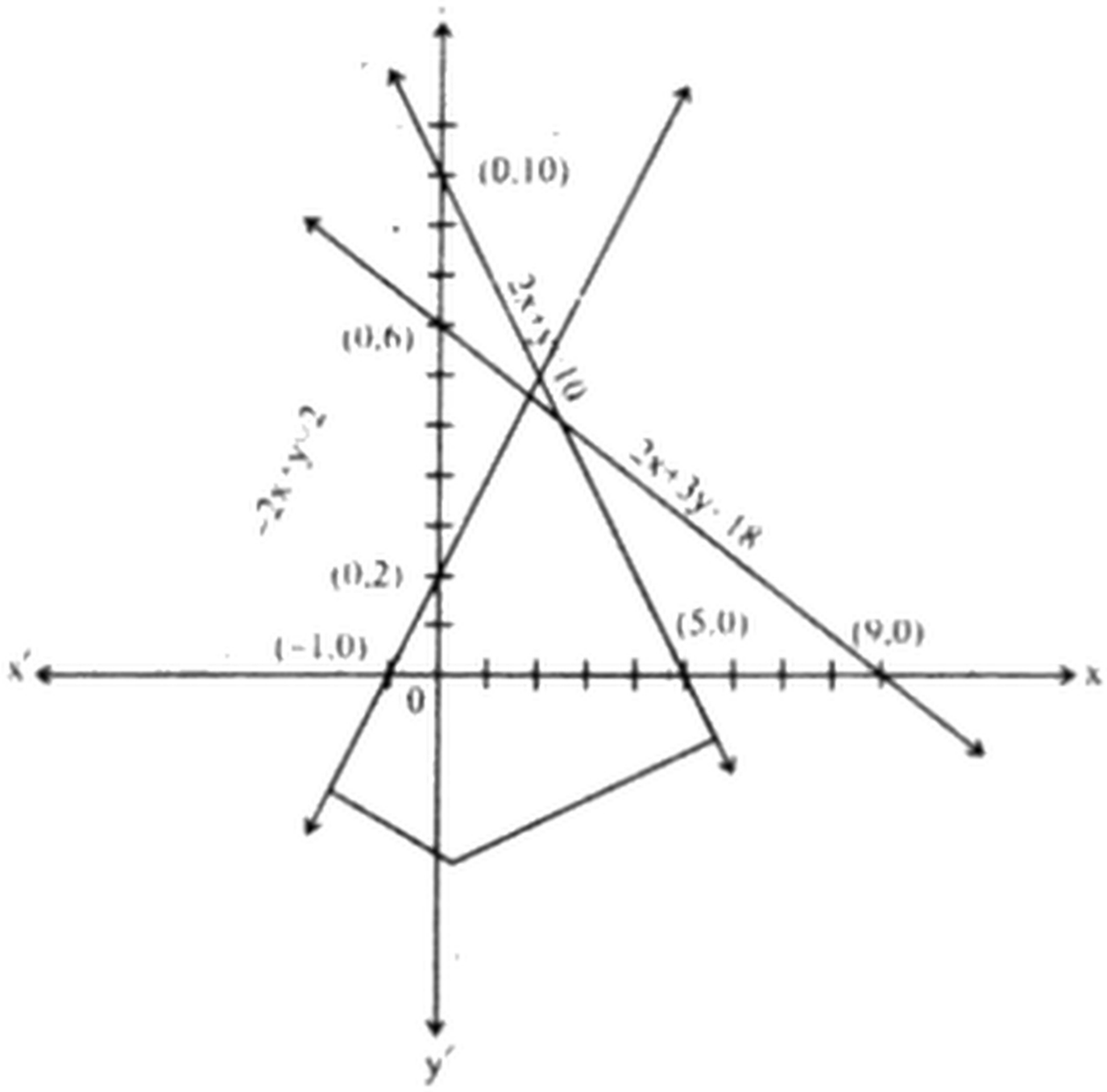
Putting $x = 0$, $y = 0$ in (5)

$0 + 0 < 12$

$0 < 12$

Which is true

The graph is


(0,10)
(0,6)
(0,2)
(-1,0)
0
(5,0)
(9,0)
x'
x
y'
2x+y=10
2x+3y=18