

XI

॥ जय श्री राधे कृष्ण ॥

(1)

← ULTIMATE MATHEMATICS : BY ADAR MITTAL →

CHAPTER: LINEAR INEQUALITIES

CLASS NO. 1

(i)  $<, >, \leq, \geq$

(ii) Intervals

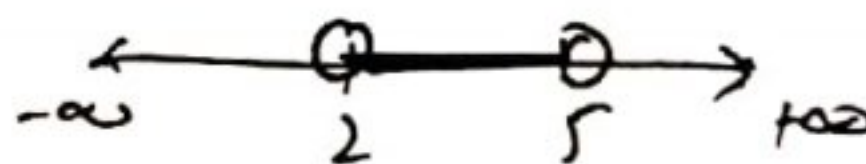
(1) Open Interval  $(, )$   $<, >$ , not Included,  $\circ$

(2) Closed Interval  $[, ]$   $\leq, \geq$ , Included,  $\bullet$

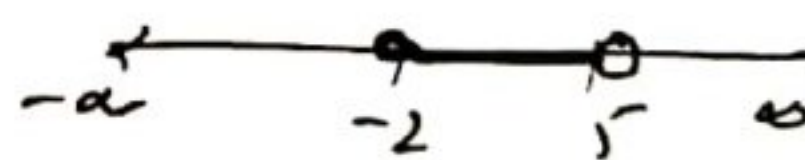
eg  
(1)  $2 \leq x \leq 5$  ;  $x \in [2, 5]$



(2)  $2 < x < 5$  ;  $x \in (2, 5)$



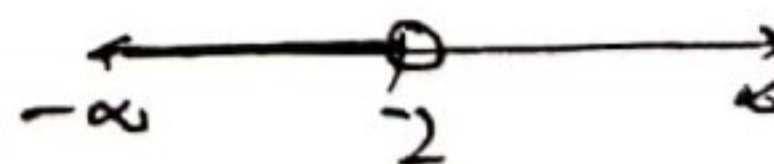
(3)  $-2 \leq x < 5$  ;  $x \in [-2, 5)$



(4)  $x \geq 5$  ;  $x \in [5, \infty)$



(5)  $x < -2$  ;  $x \in (-\infty, -2)$

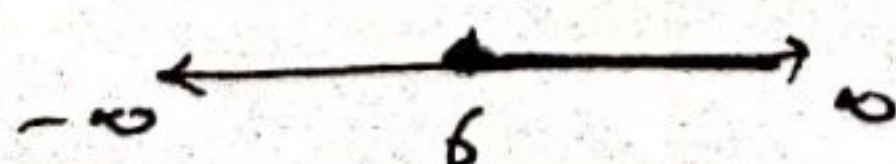


(6)  $5 \geq x \geq 3$  ;  $x \in (3, 5]$



(1) Solve  
eg  $x + 2 \leq 3x - 10$   
 $\Rightarrow -2x \leq -12$

(dividing by -2)  $\Rightarrow x \geq 6$   
 $x \in [6, \infty)$



Solve  
eg (2)  $\frac{3x+1}{2} < \frac{1-2x}{4} - x$   
 $\frac{3x+1}{2} < \frac{1-6x}{4}$   
 $12x+4 < 2-12x$   
 $24x < -2$   
 $x < -\frac{1}{12}$   
 $x \in (-\infty, -\frac{1}{12})$



# Graphical Solution

(1)  $2x + 3y \leq 6$

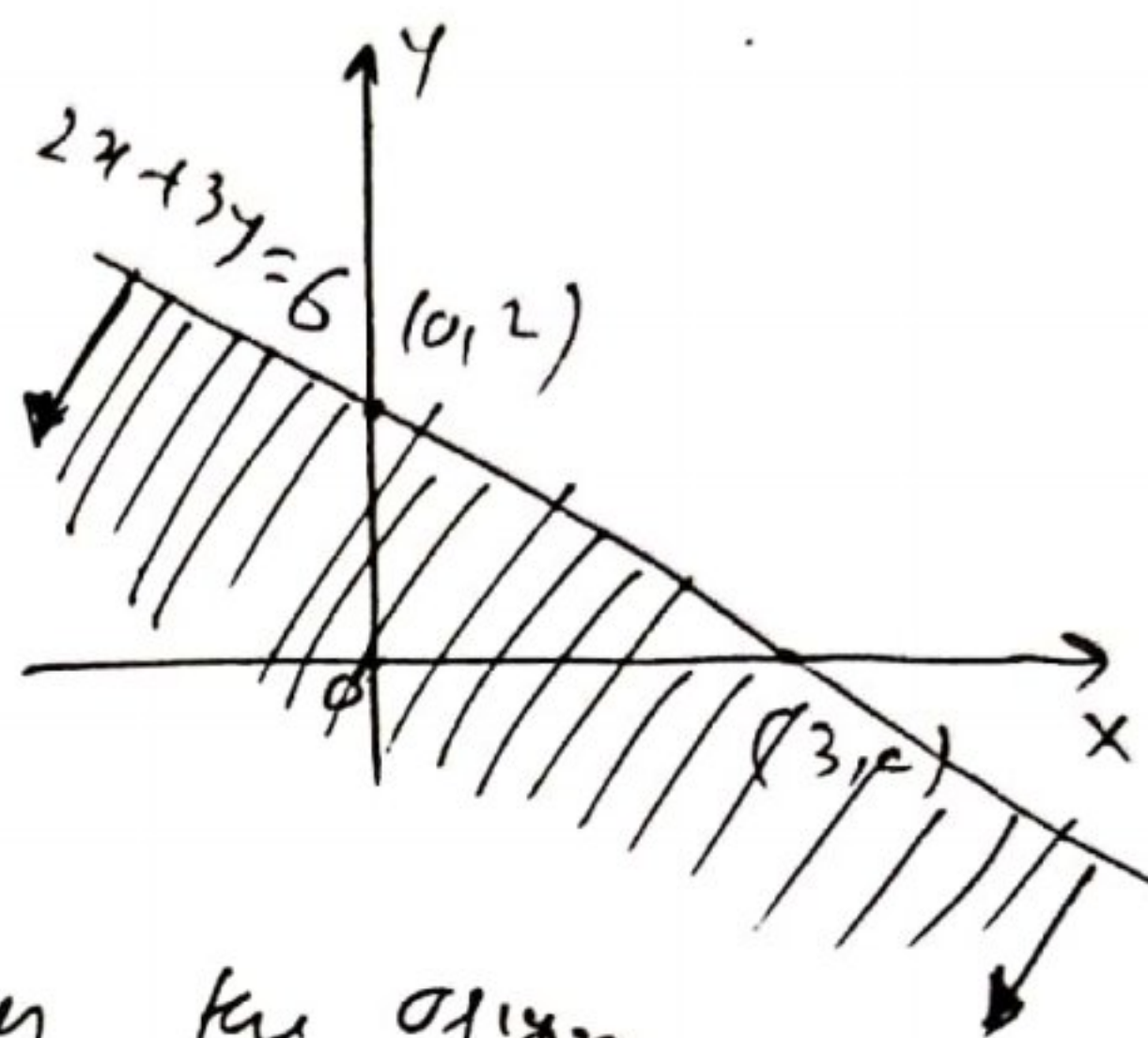
Consider  $2x + 3y = 6$

put  $x=0, y=2 \therefore (0, 2)$

put  $y=0; x=3 \therefore (3, 0)$

Solution put  $x=0, y=0$

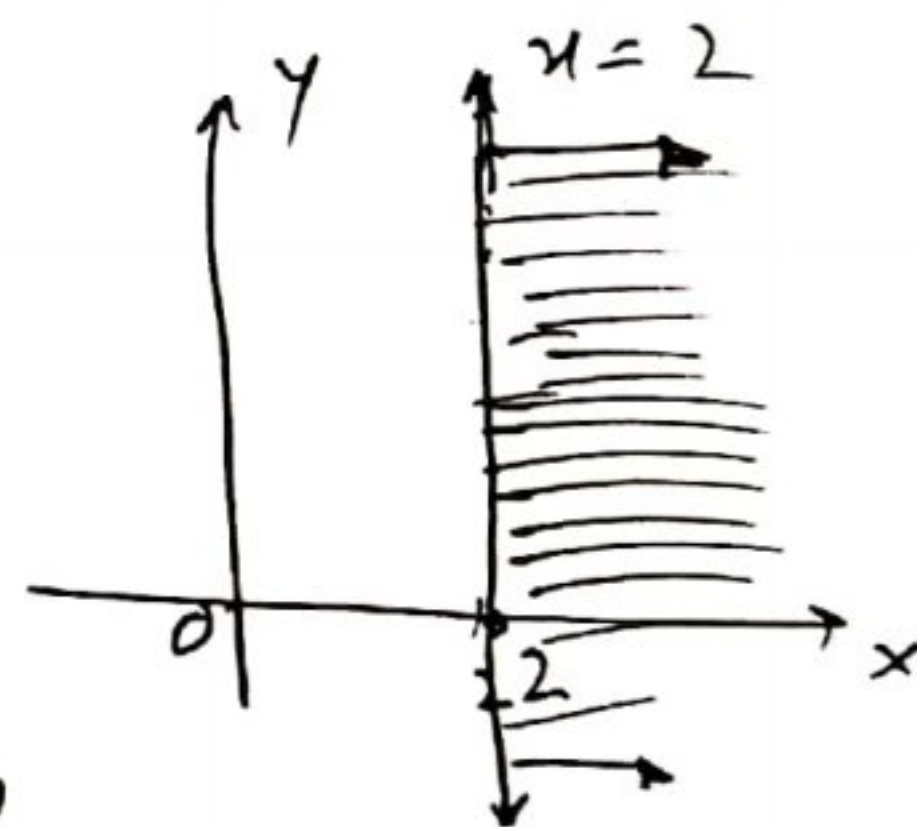
$0 \leq 6$  (True) Towards the origin



(2)  $x \geq 2$

Consider  $x=2$  (line parallel to y-axis)

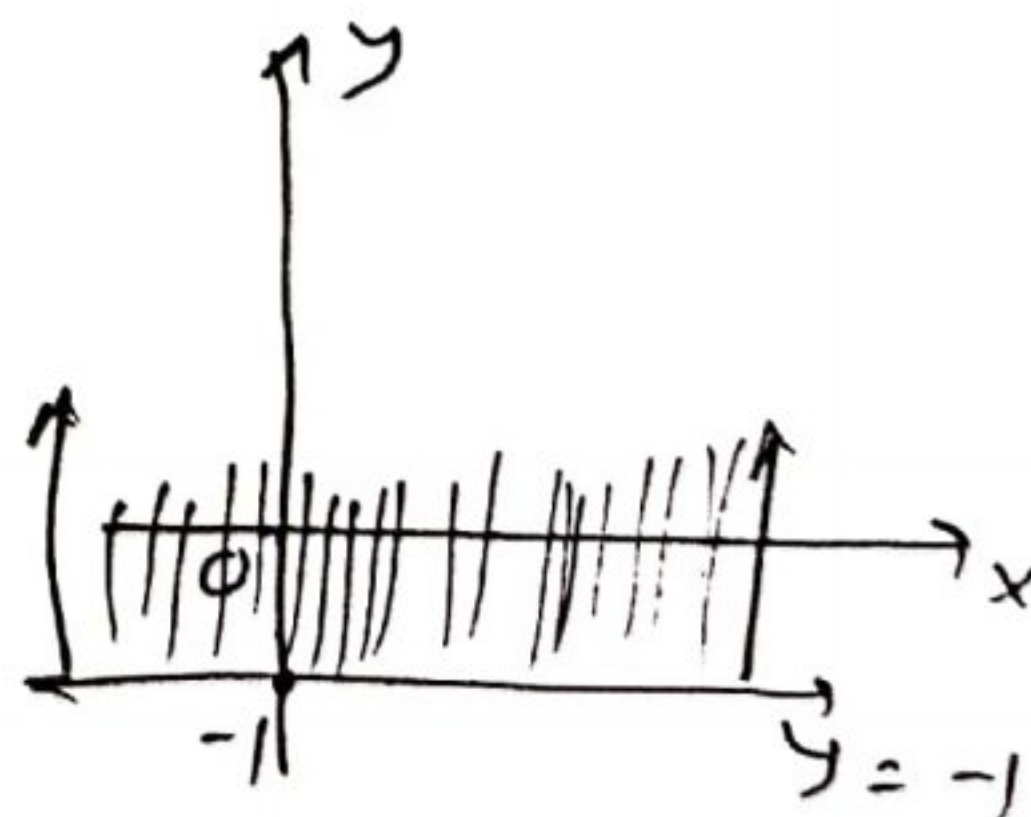
Solution  $0 \geq 2$  (False) (away from the origin)



(3)  $y \geq -1$

Consider  $y=-1$  (line parallel to x-axis)

Solution  $0 \geq -1$  (True) Towards the origin



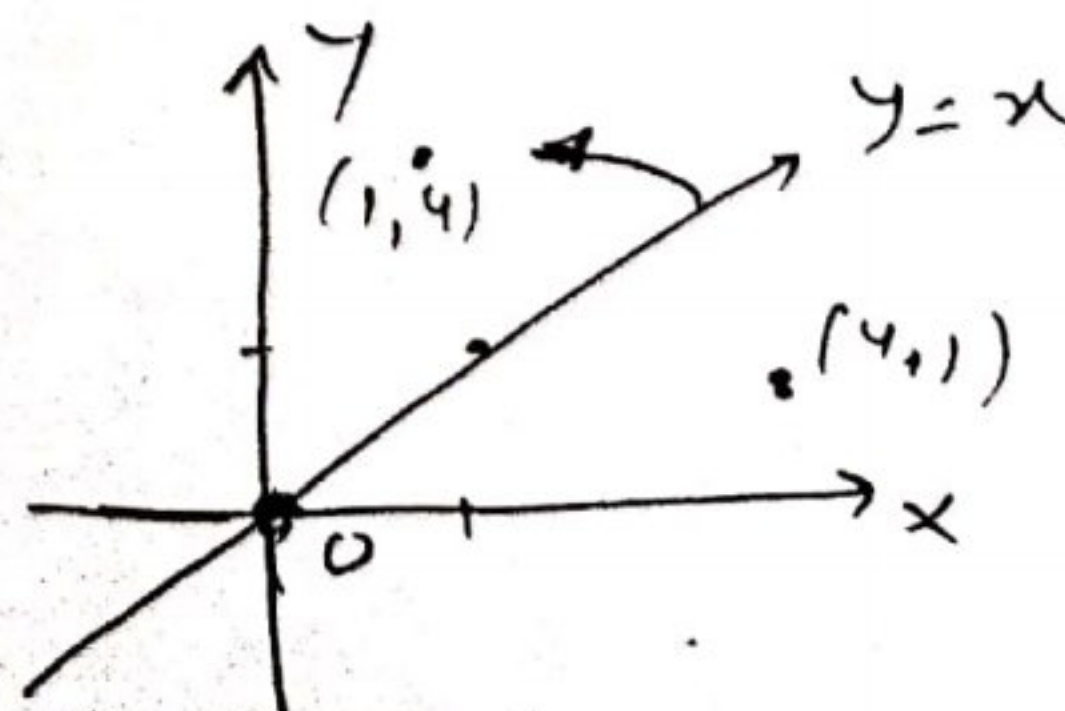
(4)  $y \geq x$

Consider  $y=x$  point  $x=0, y=0$

$x=1, y=1$

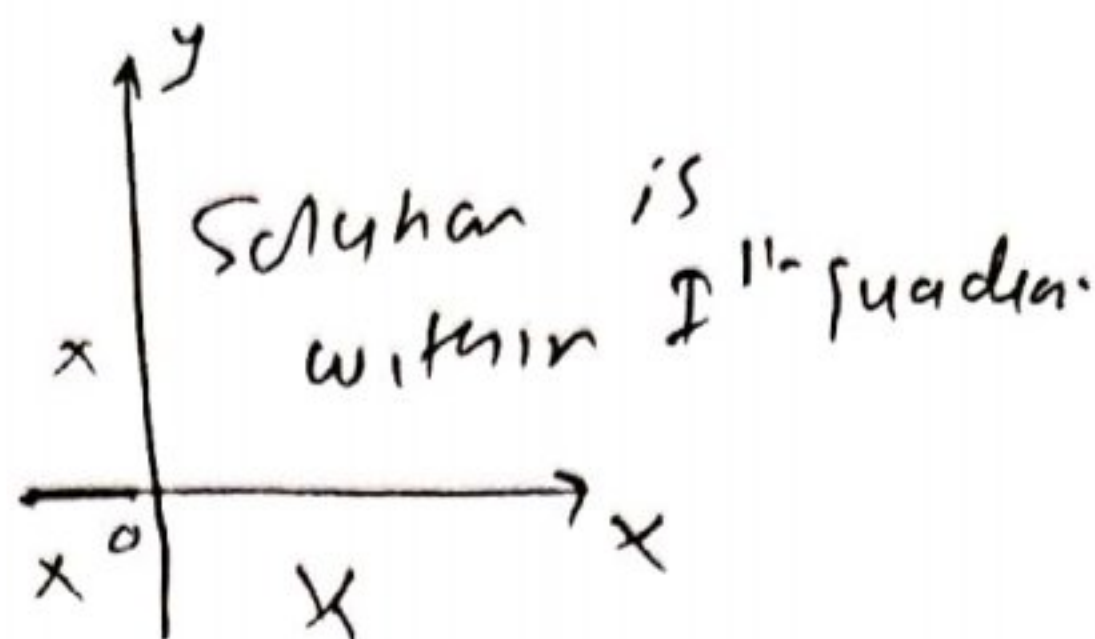
$(0,0) (1,1)$

Solution towards y-axis





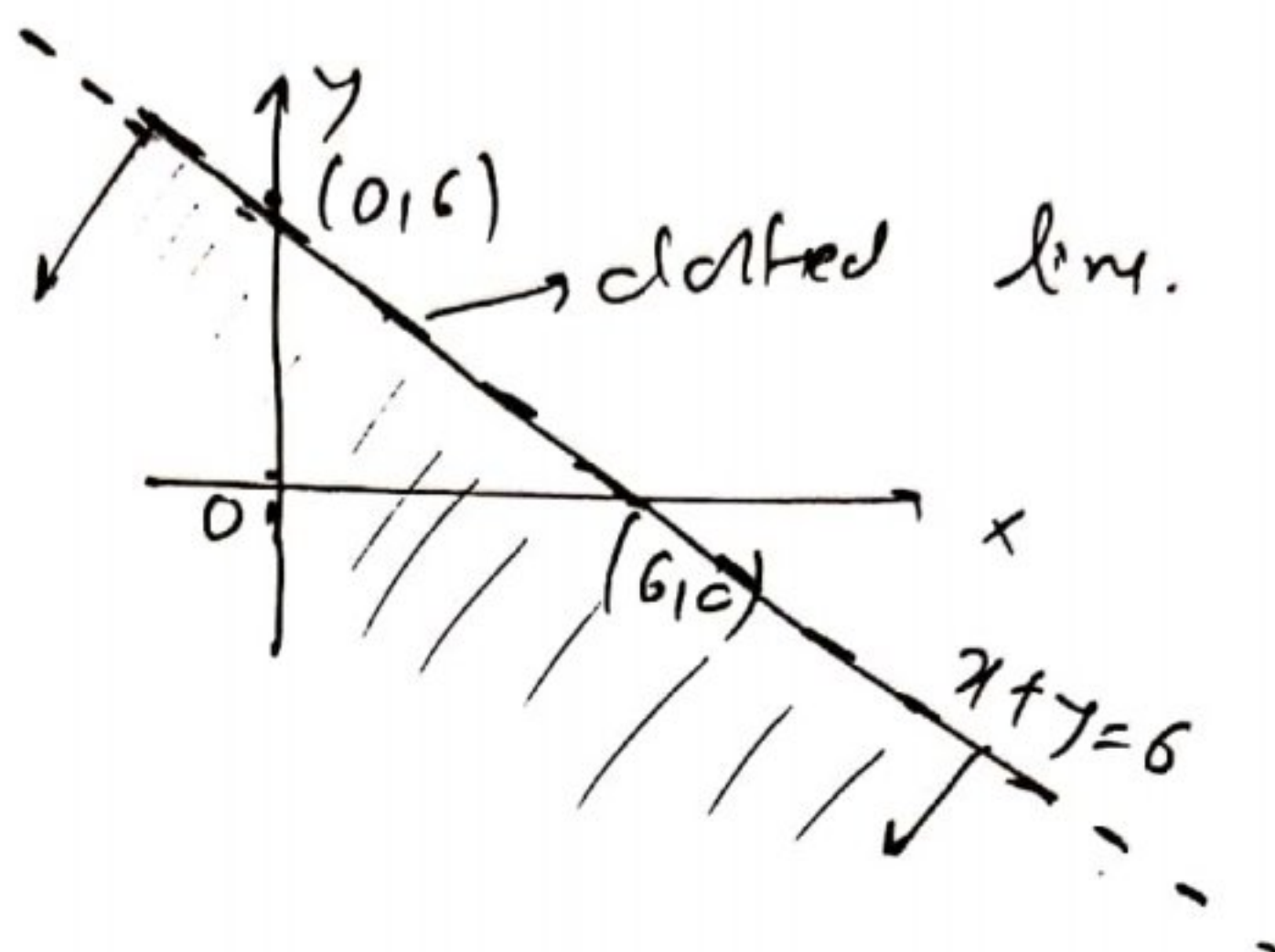
(5)  $x \geq 0, y \geq 0$   
 $\downarrow \quad \downarrow$   
 $(+ve) \quad (+ve)$



(6)  $x + y \leq 6$

Consider  $x + y = 6$   
 $= (0, 6) \quad (6, 0)$

Soln  $0 \leq 6$  (True)



① Solve graphically

$x + 2y \leq 10 ; x + y \geq 1 ; x - y \leq 0 ; x \geq 0, y \geq 0$

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

Points  $(0, 5), (10, 0)$

Soln  $0 \leq 10$   
 $=$  (Towards the origin)

(4)  $x \geq 0, y \geq 0$  Solution within 1<sup>st</sup> quad

(2)  $x + y \geq 1$

Points  $(0, 1), (1, 0)$

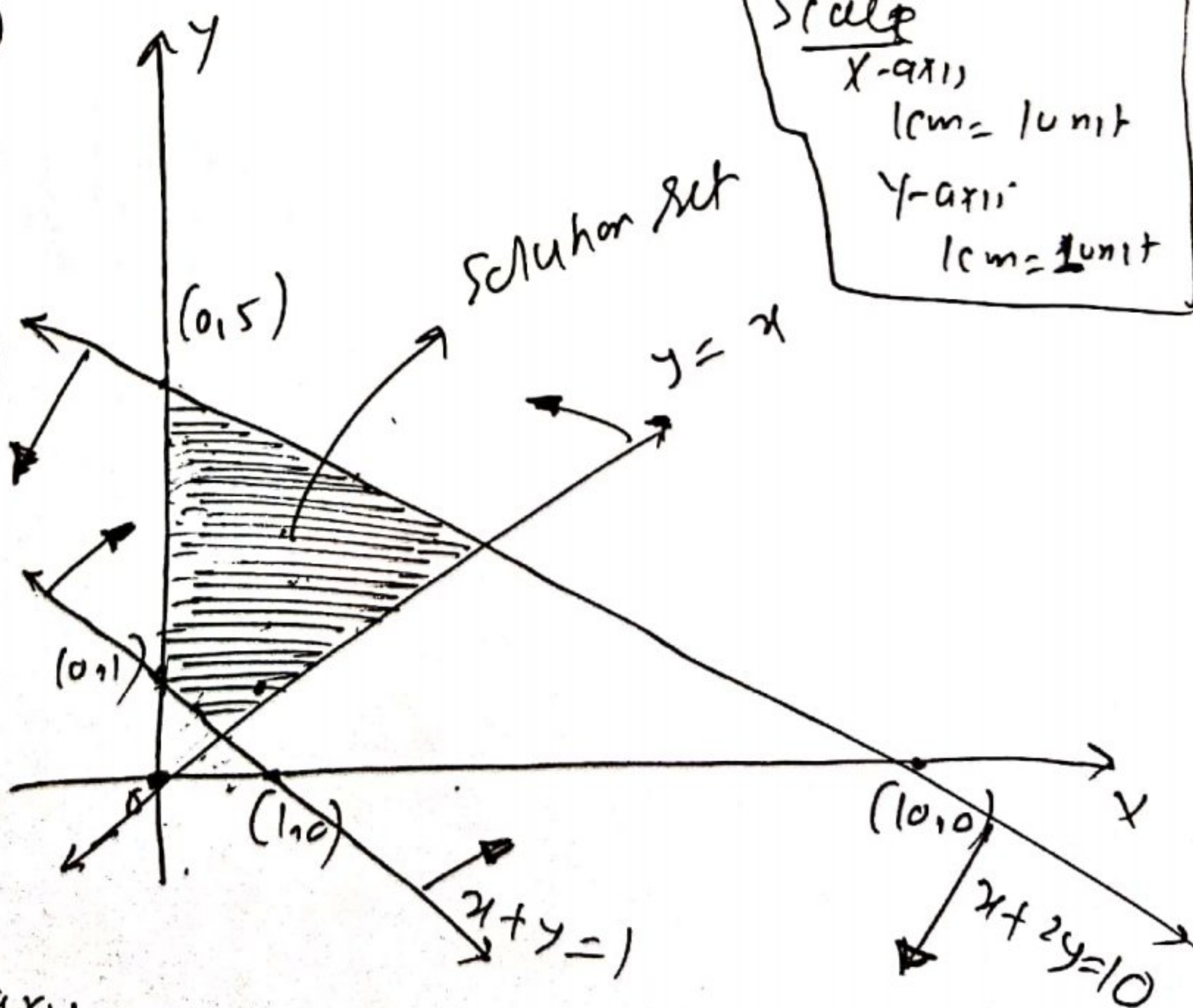
Soln  $0 \geq 1$   
 $=$  (away from origin)

(3)  $x - y \leq 0$

$x \leq y$

Points  $(0, 0), (1, 1)$

Soln : towards the y-axis



Scale  
 X-axis  
 1cm = 1 unit  
 Y-axis  
 1cm = 1 unit



Q. No. 2 → Solve graphically

$$x - 2y \leq 3 ; 3x + 4y \geq 12 ; y \geq 1, x \geq y ; x \geq 0$$

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

Points  $(0, -\frac{3}{2})$   $(3, 0)$

Soln  $0 \leq 3$   
(towards the origin)

(2)  $3x + 4y \geq 12$

Points  $(0, 3)$   $(4, 0)$

Soln  $0 \geq 12$   
(away from origin)

(3)  $y \geq 1$

line parallel to x-axis

Soln  $0 \geq 1$   
(away)

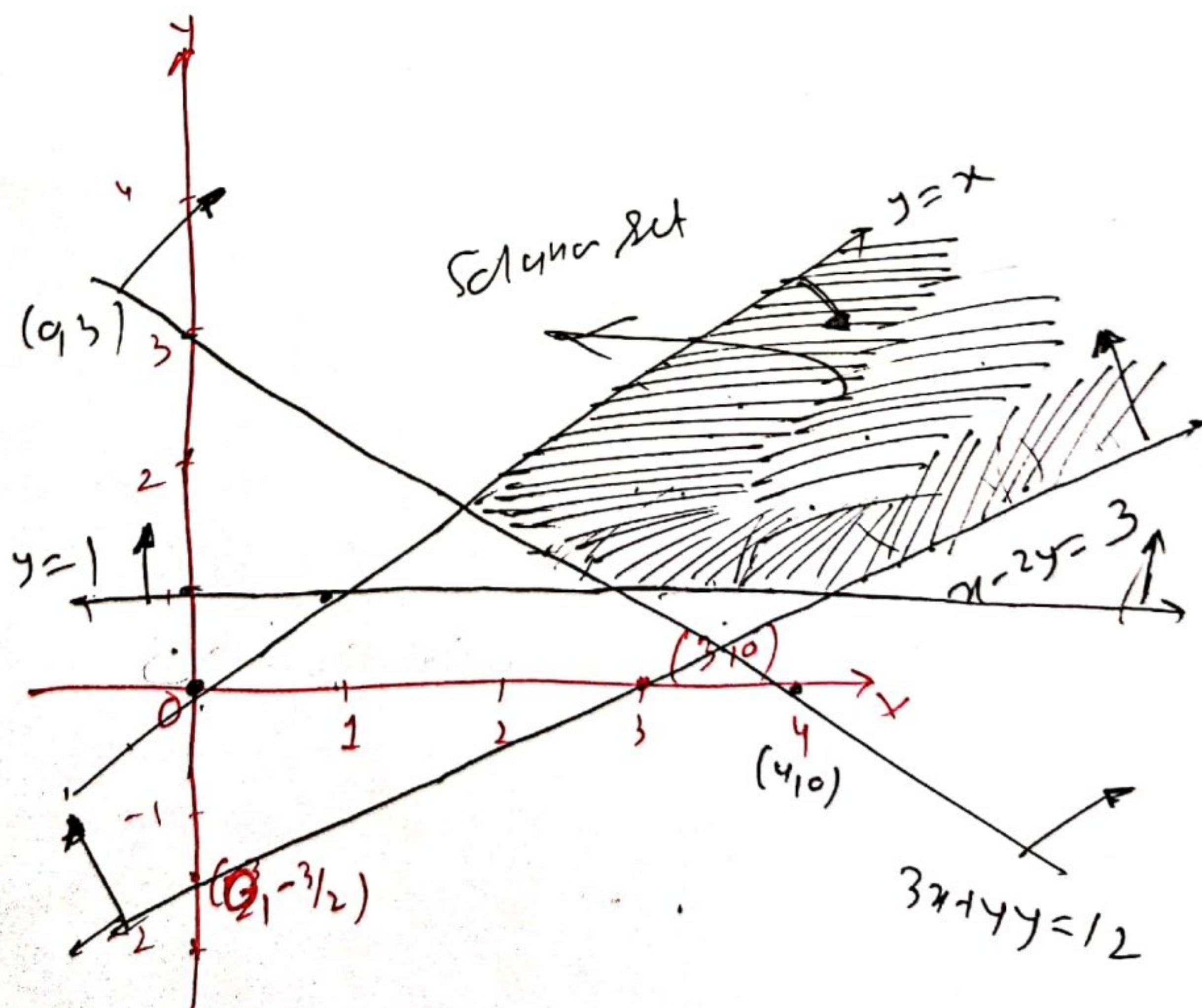
(4)  $x \geq y$

$(0, 0)$   $(1, 1)$

Soln towards x-axis

(5)  $x \geq 0$

Soln within I<sup>st</sup> & 4<sup>th</sup> quad





X

# WORKSHEET No: 1

## (LINEAR EQUALITIES)

Solve Graphically (Qno 1 to 7)

Q.1  $3x + 2y \leq 150$ ;  $x + 4y \leq 80$ ;  $x \leq 15$ ;  $x \geq 0$ ,  $y \geq 0$

Q.2  $4x + 3y \leq 60$ ;  $y \geq 2x$ ;  $x \geq 3$ ;  $x, y \geq 0$

Q.3  $2x + y \geq 4$ ;  $x + y \leq 3$ ;  $2x - 3y \leq 6$

Q.4  $5x + 4y \leq 20$ ;  $x \geq 1$ ,  $y \geq 2$

Q.5  $x + y \leq 4$ ;  $y \leq 3$ ;  $x \leq 3$ ;  $x + 5y \geq 4$ ;  
 $6x + 2y \geq 8$ ;  $x \geq 0$ ,  $y \geq 0$

Q.6  $2x + 3y \geq 6$ ;  $4x + 6y \leq 24$ ;  $-3x + 2y \leq 3$ ;  
 $x - 2y \leq 2$ ;  $x \geq 0$ ,  $y \geq 0$ ,  $x \geq y$

Q.7  $2x + 3y \geq 3$ ;  $3x + 4y \leq 18$ ;  $-7x + 4y \leq 14$ ;  
 $x - 6y \leq 3$ ;  $x \geq 0$ ,  $y \geq 0$

Solve the Inequalities, and show solution on number line

Q.8  $\frac{x+5}{3} - 2 \leq \frac{3x-1}{4} + 1$

Q.9  $\frac{2(x-1)}{5} \leq \frac{3(2+x)}{7}$

Q.10  $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$