



gradeup

Sahi Prep Hai Toh Life Set Hai

COORDINATE GEOMETRY

[PART-1]

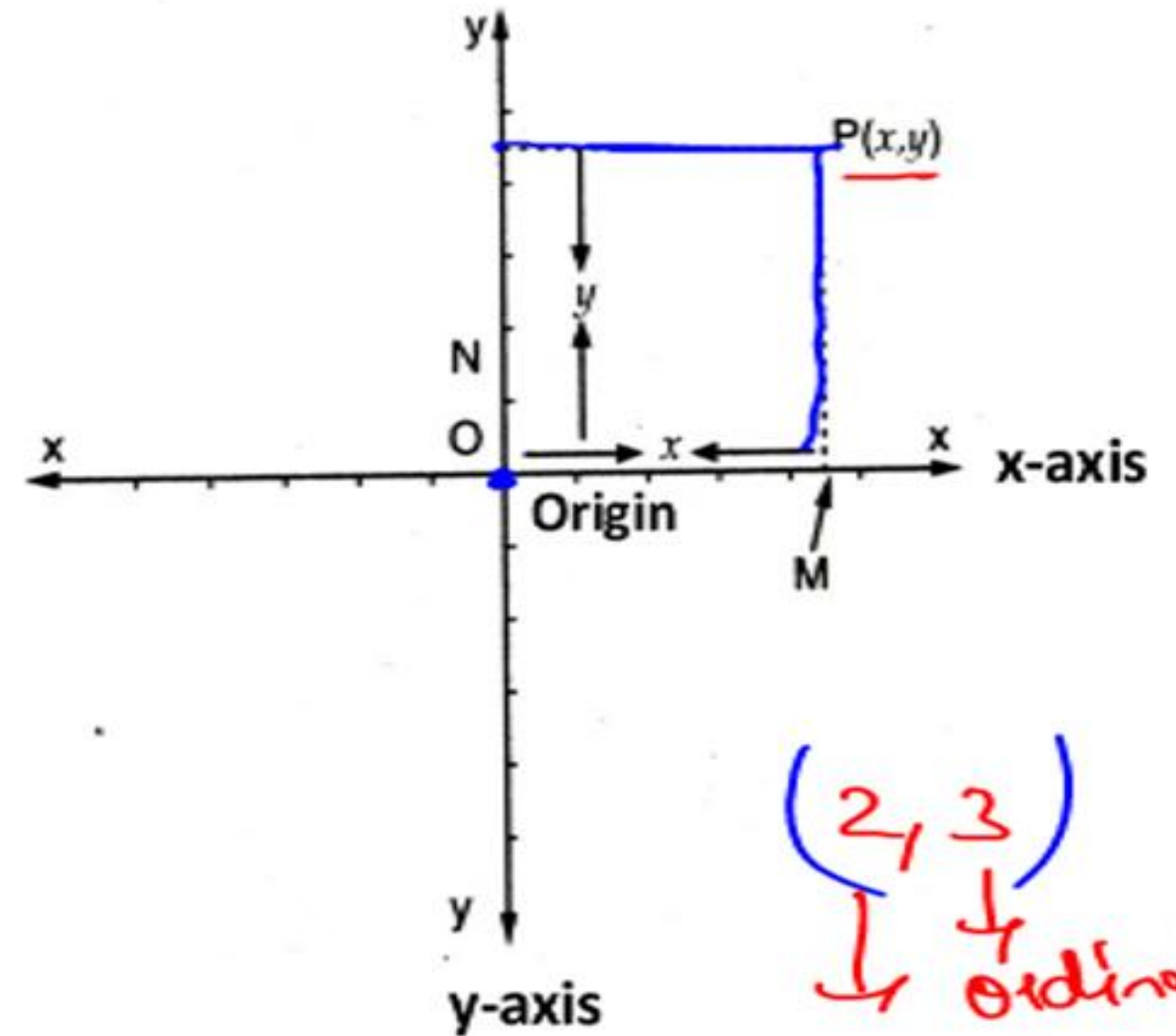
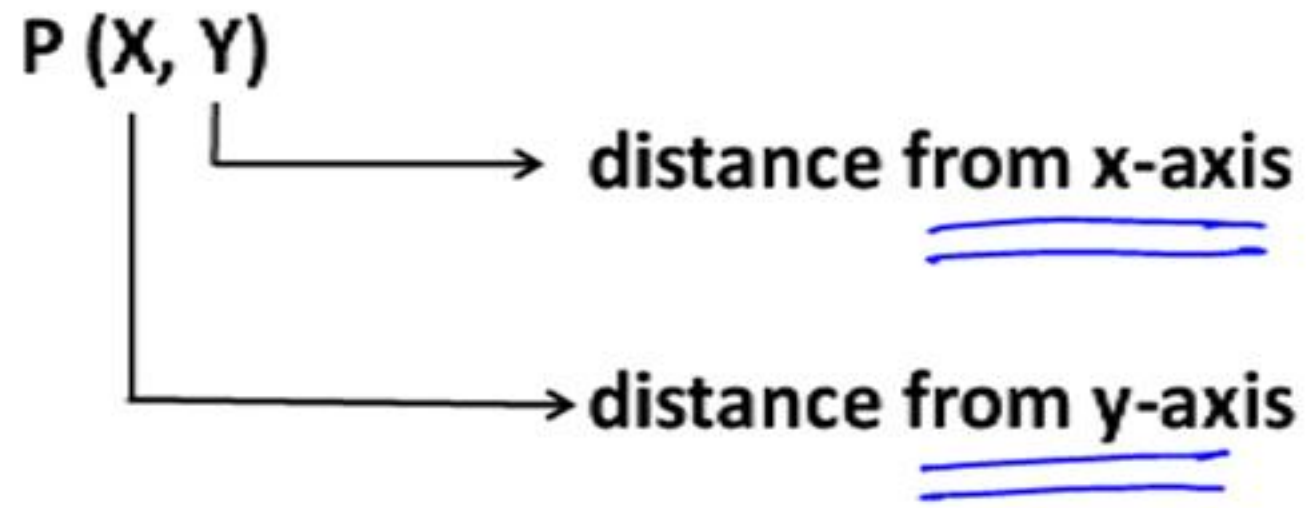
COORDINATE GEOMETRY

- ✓ 1. Meaning of Point
- ✓ 2. Distance Formula
- ✓ 3. Mid-Point Formula
- ✓ 4. Internal/External Division
- ✓ 5. Slope of a Line
- ✓ 6. Equations of Line

- ✓ 7. Area of Triangle/Quadrilateral/Polygon
- ✓ 8. Collinear Points
- ✓ 9. Angle between two lines
- ✓ 10. (i) Distance of a point from a line
(ii) Distance between 2 parallel lines
- ✓ 11. Centroid/Incentre
- ✓ 12. Reflection

* 13 Consistent & Inconsistent

COORDINATE GEOMETRY



(x, y)

$X \rightarrow$ abscissa

$Y \rightarrow$ ordinate



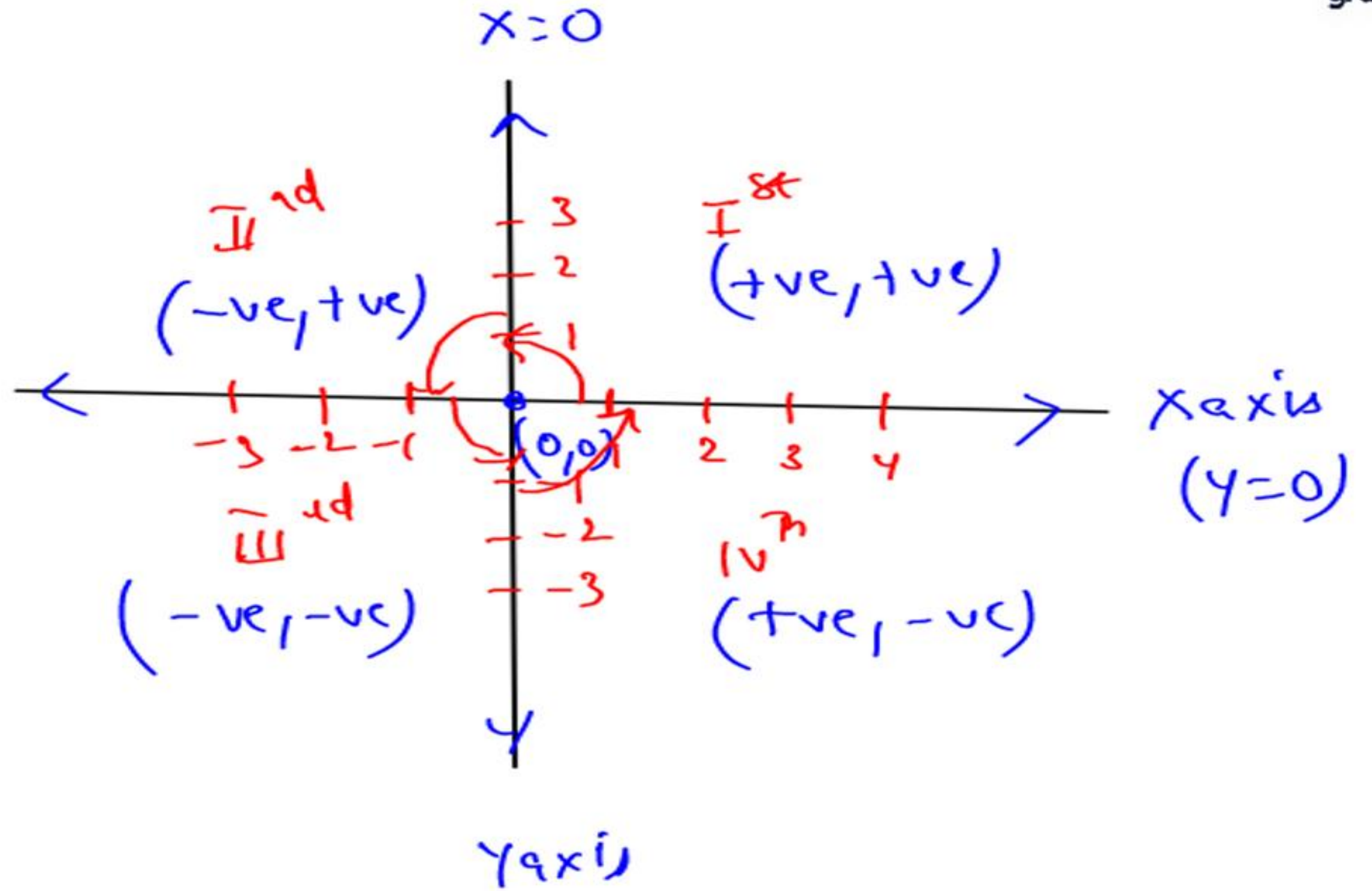
$(2, 3)$

$\downarrow \downarrow$

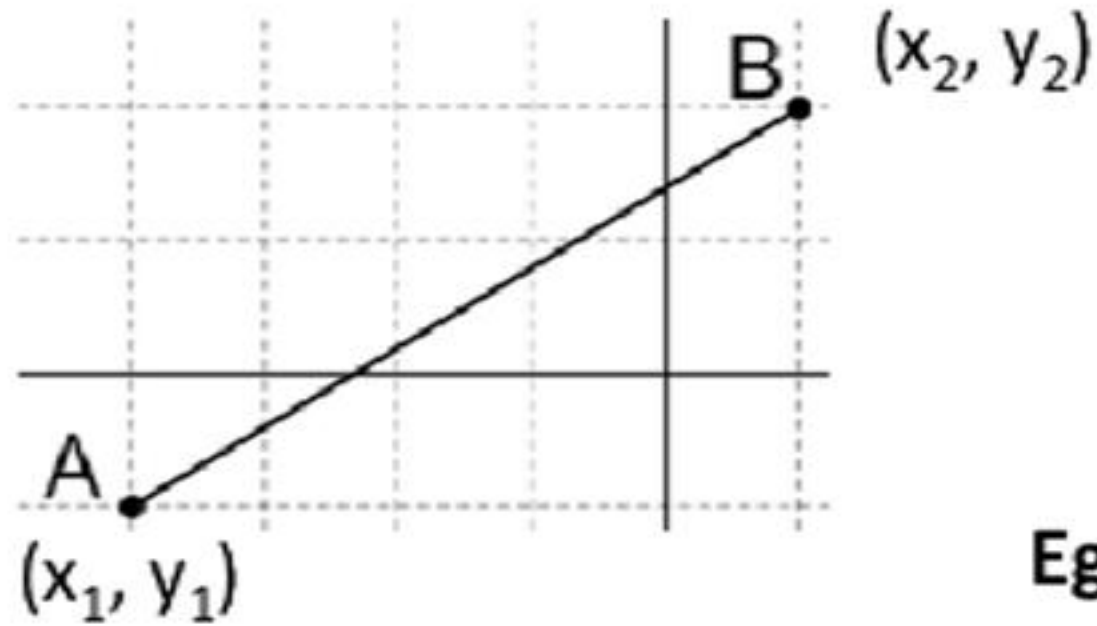
ordinate

abscissa

(X, Y) coordinates of a point.



DISTANCE FORMULA



$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Eg. Find the distance between P $(\overset{x_1}{2}, \overset{y_1}{5})$ & Q $(\overset{x_2}{5}, \overset{y_2}{9})$.

$$\Rightarrow \sqrt{(5-2)^2 + (9-5)^2}$$

$$\Rightarrow 5$$

Eg. Find the value of x , if the distance between the points $(x, -1)$ and $(3, 2)$ is 5.

$$\sqrt{(3-x)^2 + (3)^2} = 5$$

$$(3-x)^2 + (3)^2 = 5^2$$

$$(3-x)^2 = 16$$

$$3-x = 4$$

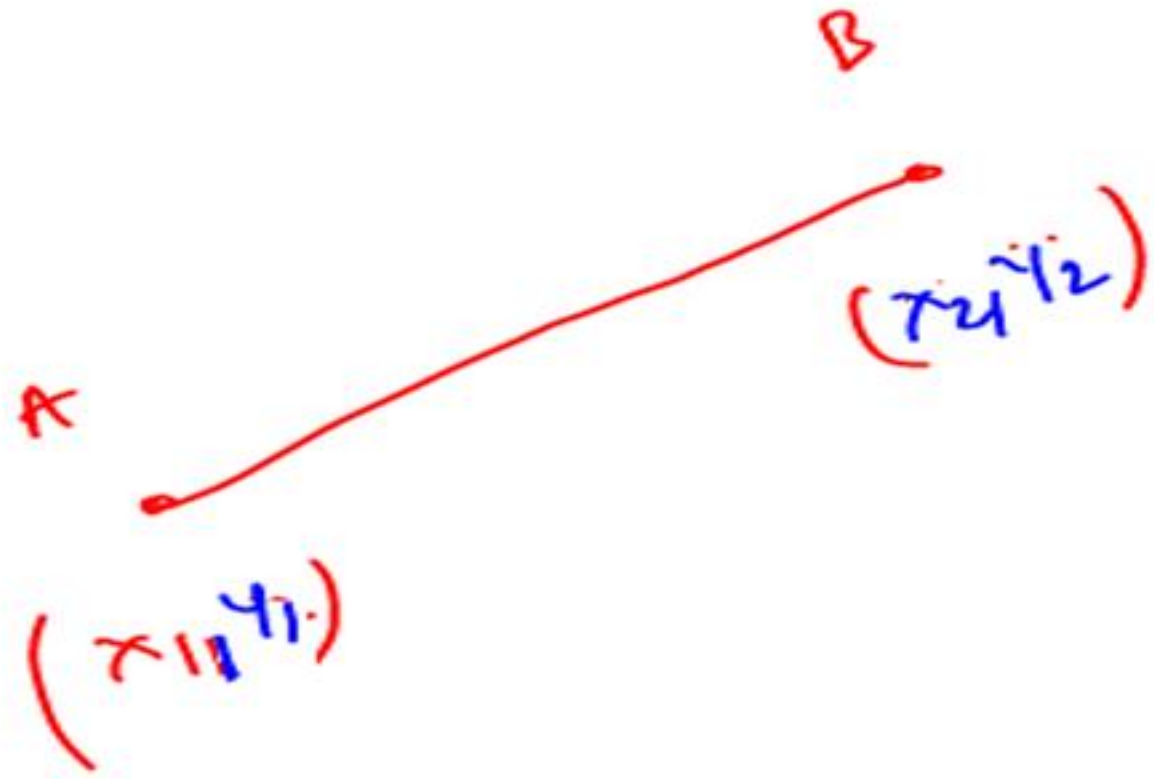
$$\boxed{x = -1}$$

$$3-x = -4$$

$$\boxed{x = 7}$$

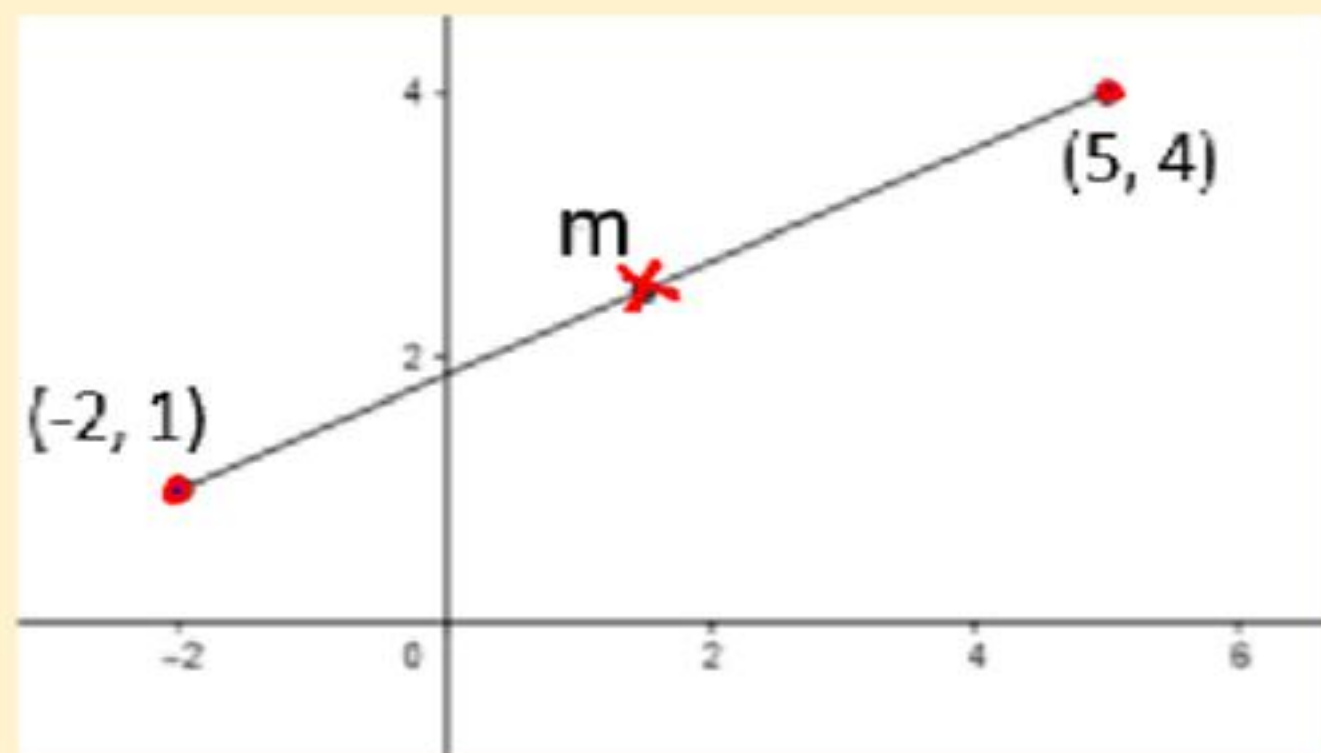
Ans. -1, 7

MID-POINT FORMULA



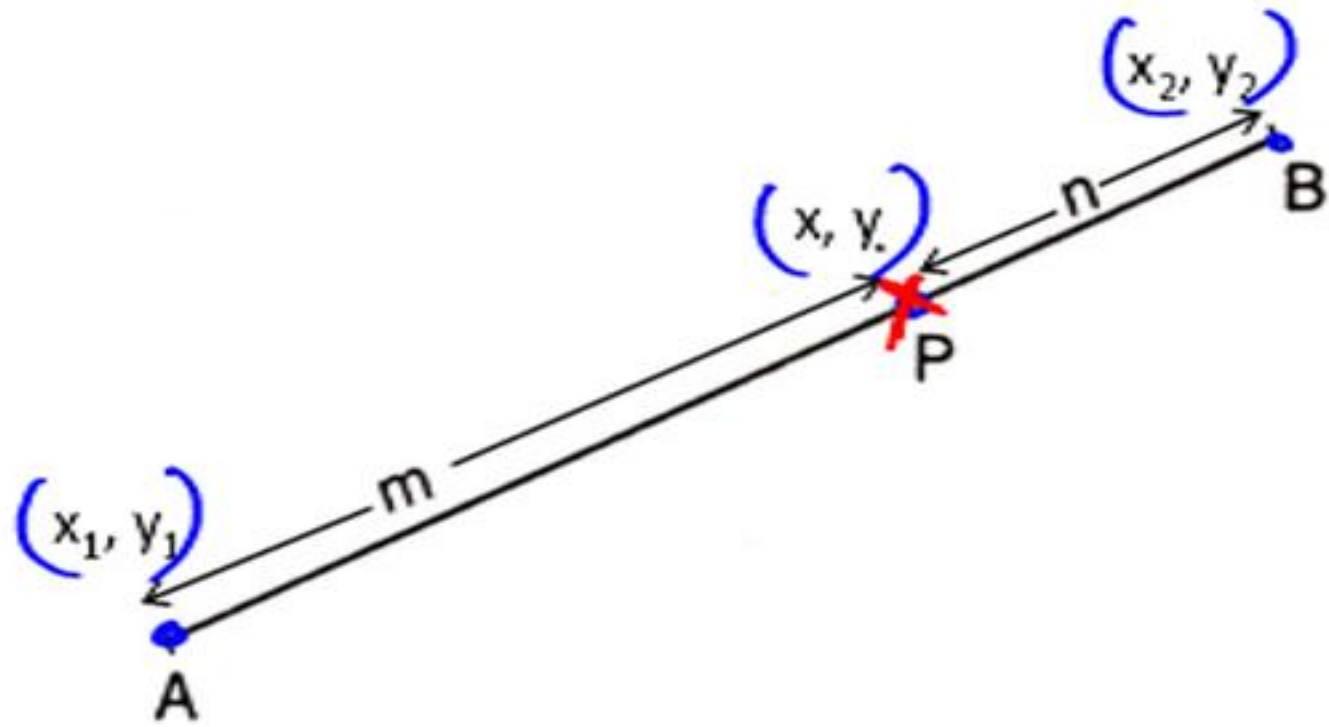
$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Eg.



$$\begin{aligned}
 m &= \left(\frac{-2+5}{2}, \frac{1+4}{2} \right) \\
 &= \left(\frac{3}{2}, \frac{5}{2} \right) \\
 &= \underline{\underline{(1.5, 2.5)}}
 \end{aligned}$$

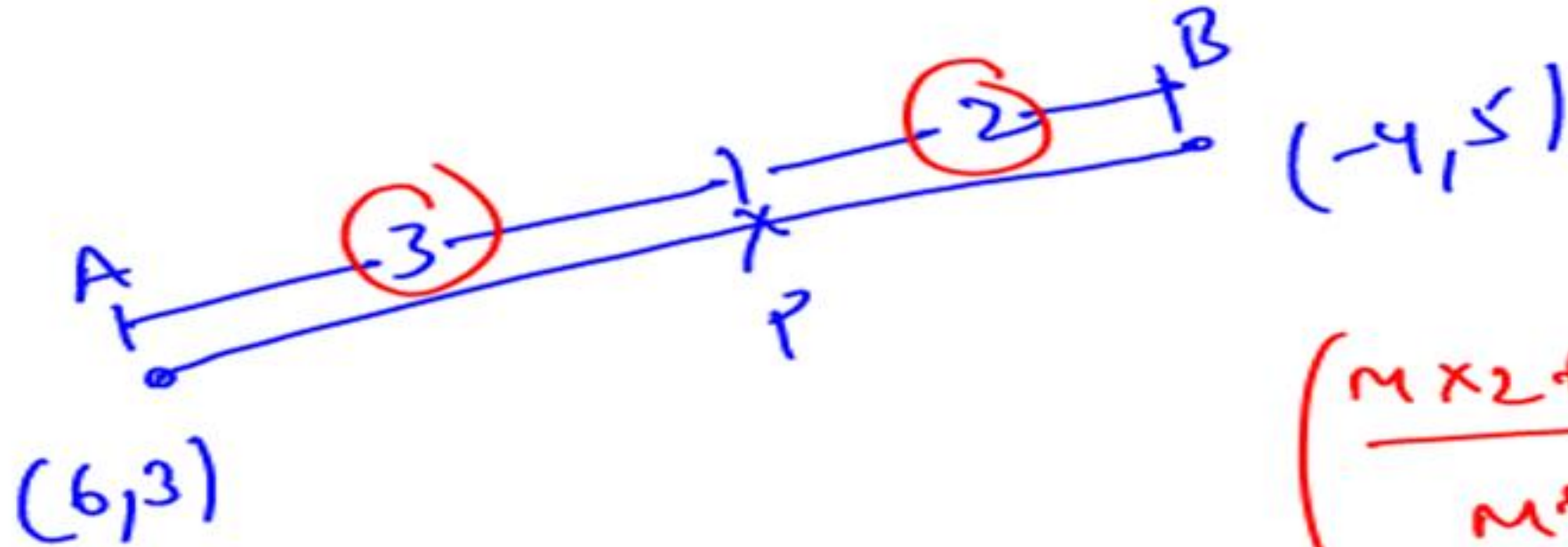
INTERNAL DIVISION FORMULA



Coordinates of P

$$x = \frac{mx_2 + nx_1}{m + n}, y = \frac{my_2 + ny_1}{m + n}$$

Eg. Find the coordinates of the point which divides the line segment joining the points $(6, 3)$ and $(-4, 5)$ in the ratio $3:2$ internally.



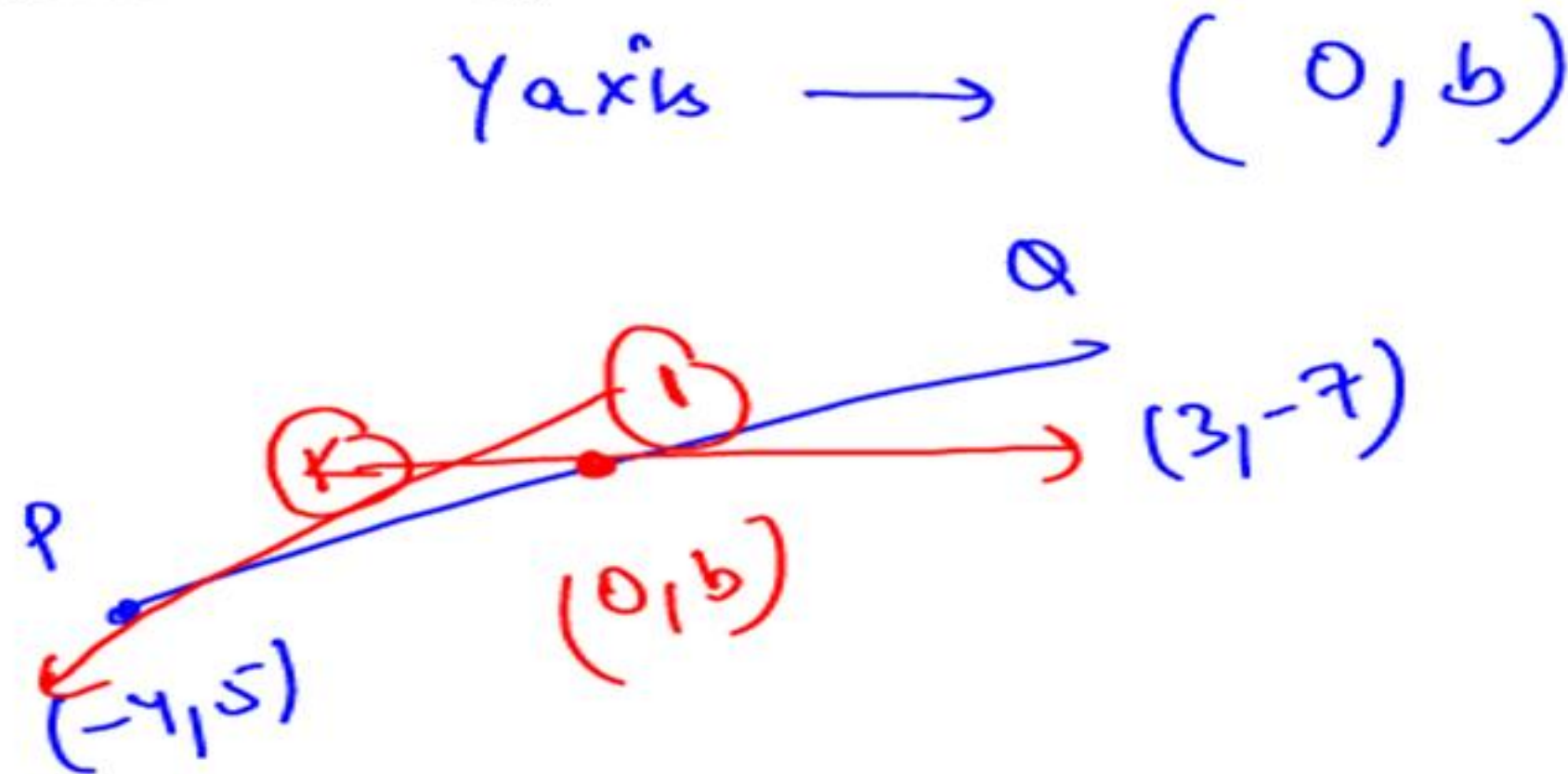
$$\left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n} \right)$$

$$\left[\frac{3(-4) + 2(6)}{3+2}, \frac{3(5) + 2(3)}{3+2} \right]$$

$$\left(0, \frac{24}{5} \right)$$

Ans. 0, 21/5

Eg. In what ratio does the y-axis divide the line segment joining the points P (-4,5) and Q (3,-7)? Also find the coordinates of the points of intersection.



$$\frac{4}{3} : 1$$

$$\boxed{4 : 3}$$

$$\left(\frac{3k-4}{k+1}, \frac{-7k+5}{k+1} \right) = (0, b)$$

$$\frac{3k-4}{k+1} = 0$$

$$k = \frac{4}{3}$$

$$\frac{-7\left(\frac{4}{3}\right) + 5}{\frac{4}{3} + 1}$$

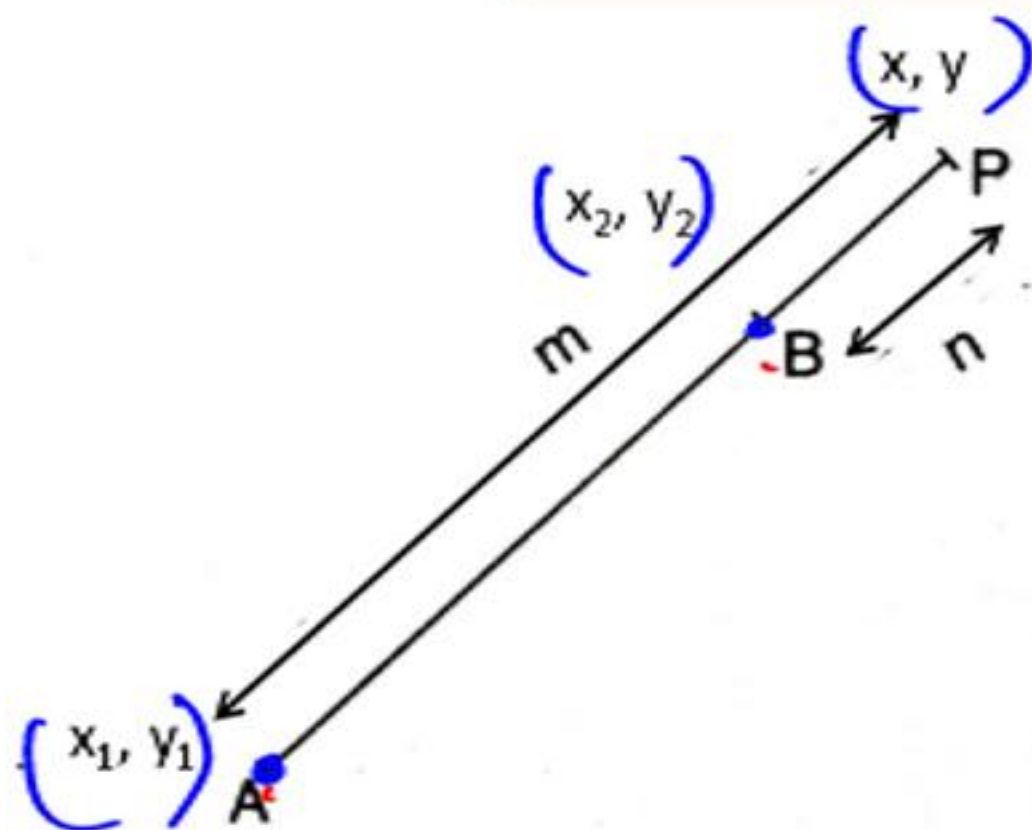
$$\left(0, -\frac{13}{7} \right)$$

$$\frac{-13}{7}$$

Ans.

4 : 3 & (0, -13/7)

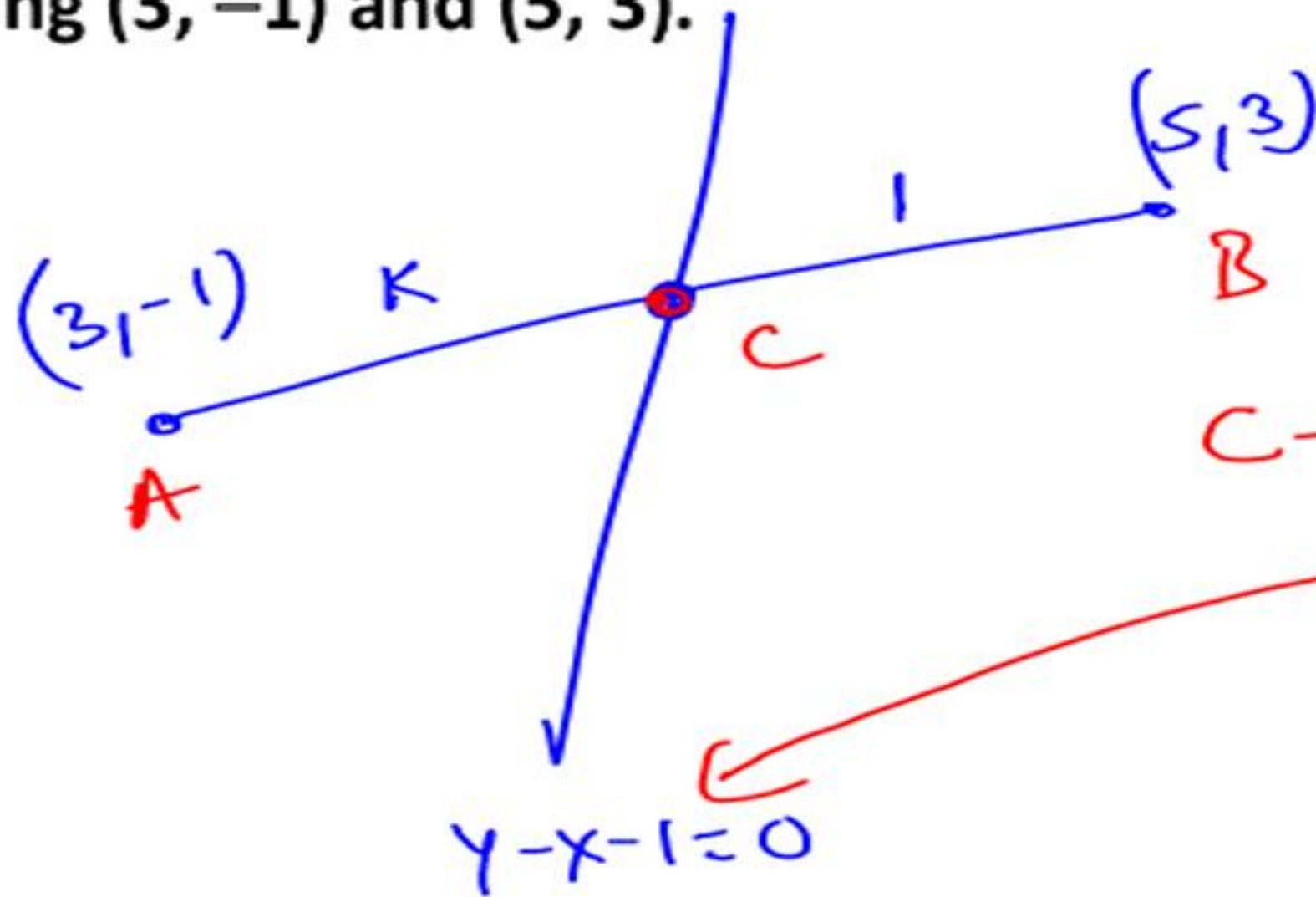
EXTERNAL DIVISION FORMULA



$$\left[\frac{mx_2 - nx_1}{m - n}, \frac{my_2 - ny_1}{m - n} \right]$$

Eg. Find the ratio in which $y - x - 1 = 0$ divides the line segment joining $(3, -1)$ and $(5, 3)$.

Time 90sec



$$C \rightarrow \left(\frac{5K+3}{K+1}, \frac{3K-1}{K+1} \right)$$

$$\frac{3K-1}{K+1} - \left(\frac{5K+3}{K+1} \right) - 1 = 0$$

$$3K-1-5K-3-K-1=0$$

$$3K=-5 \quad K=-5/3$$

$$\frac{5}{3} : 1$$

5 : 3 externally

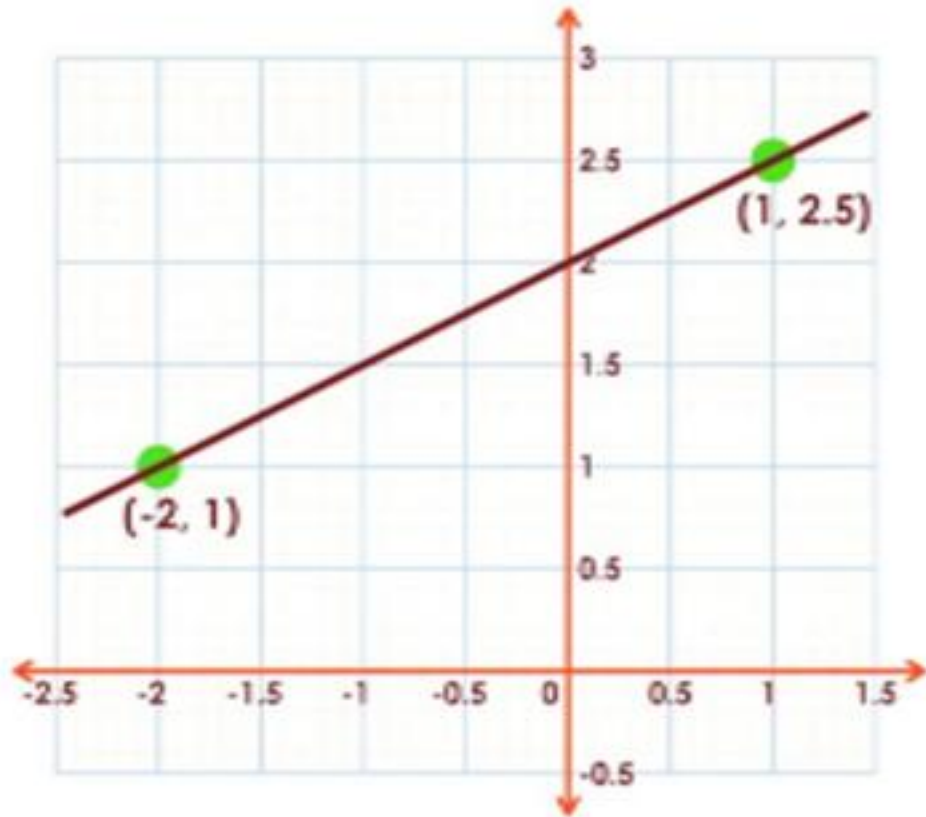
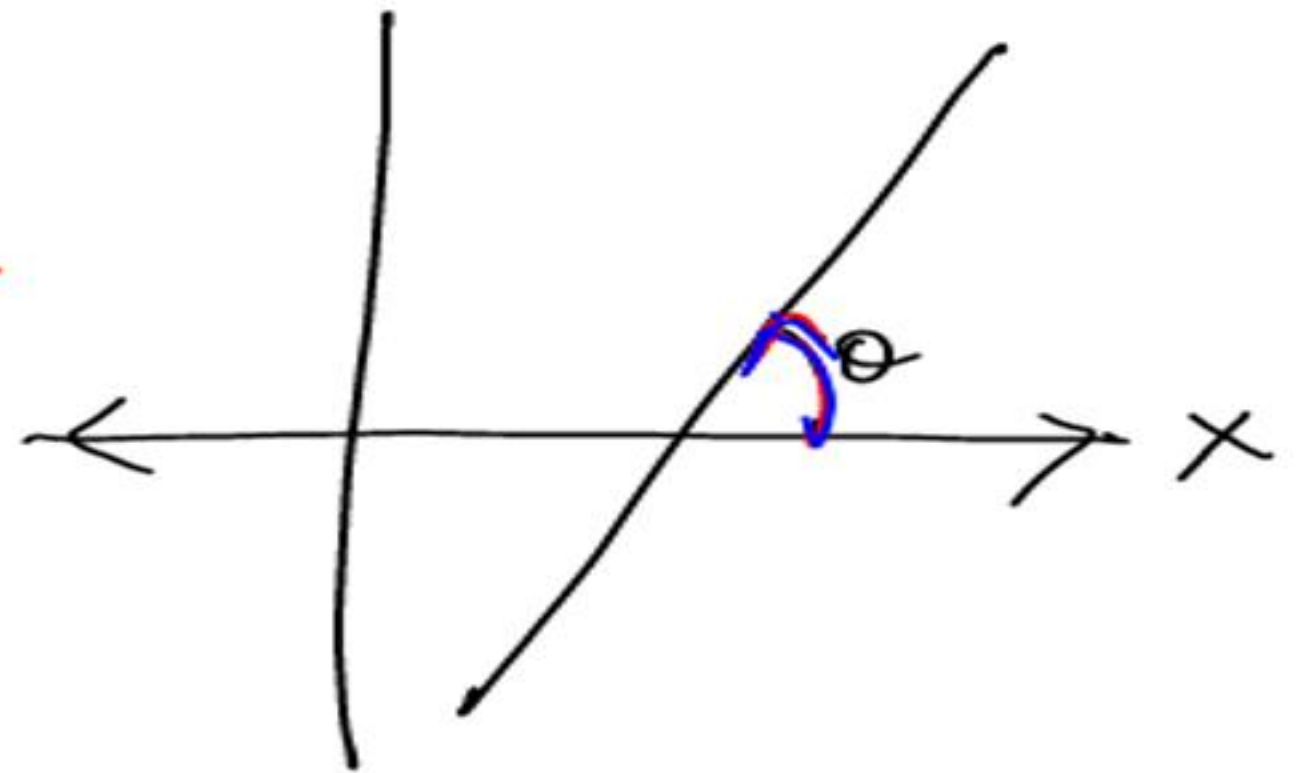
Ans. 5 : 3 externally

SLOPE OF LINE

Def: Inclination of a line with positive x-axis.

$$m = \tan \theta$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



$$m = \frac{1.5}{3} = \frac{1}{2}$$

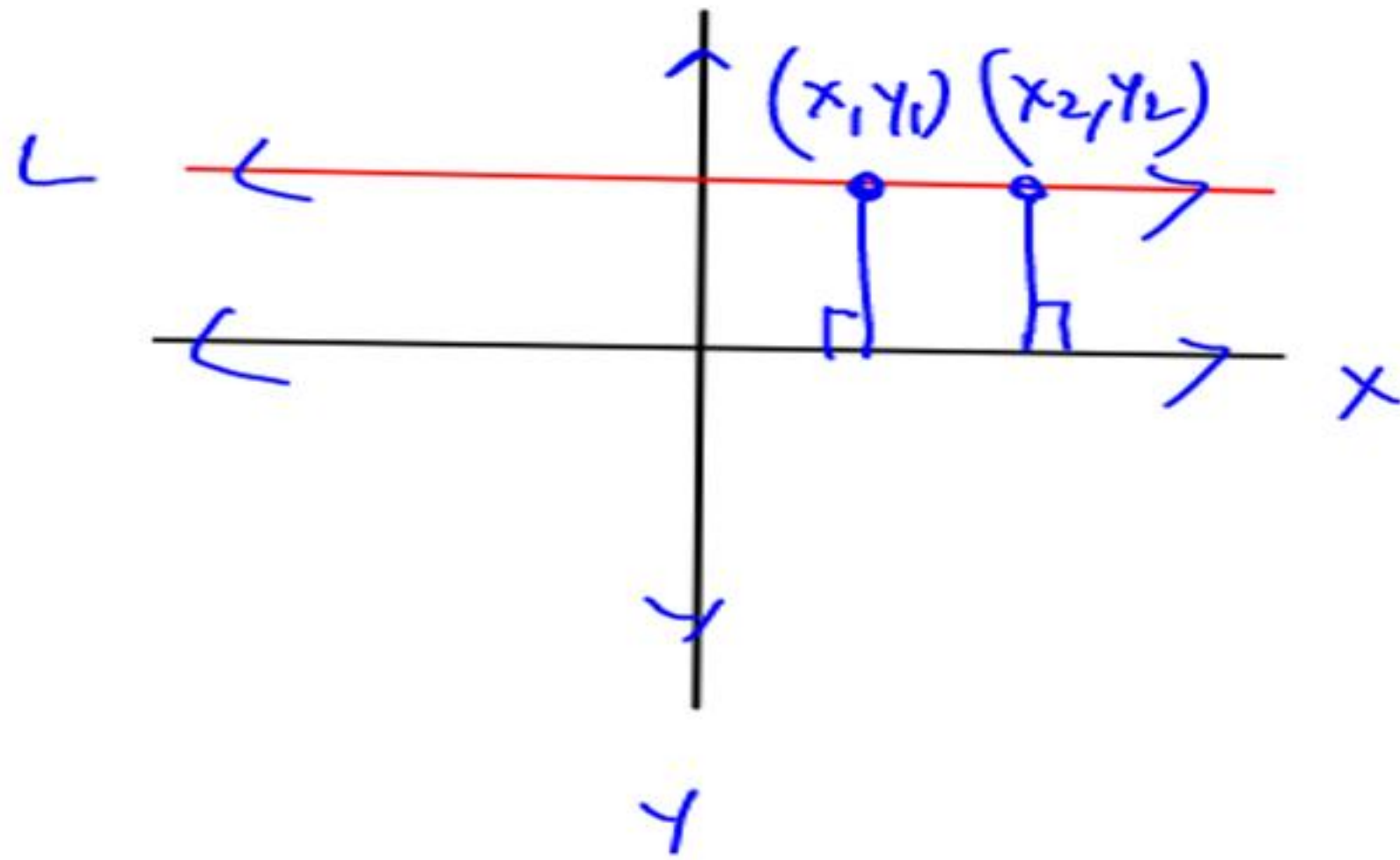
Eg. Find the slope of a line which passes through (x_1, y_1) and (x_2, y_2) .

$$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{11}{-12}$$

$$\Rightarrow \frac{-11}{12}$$

Slope of a line parallel to x-axis or perpendicular to y-axis.

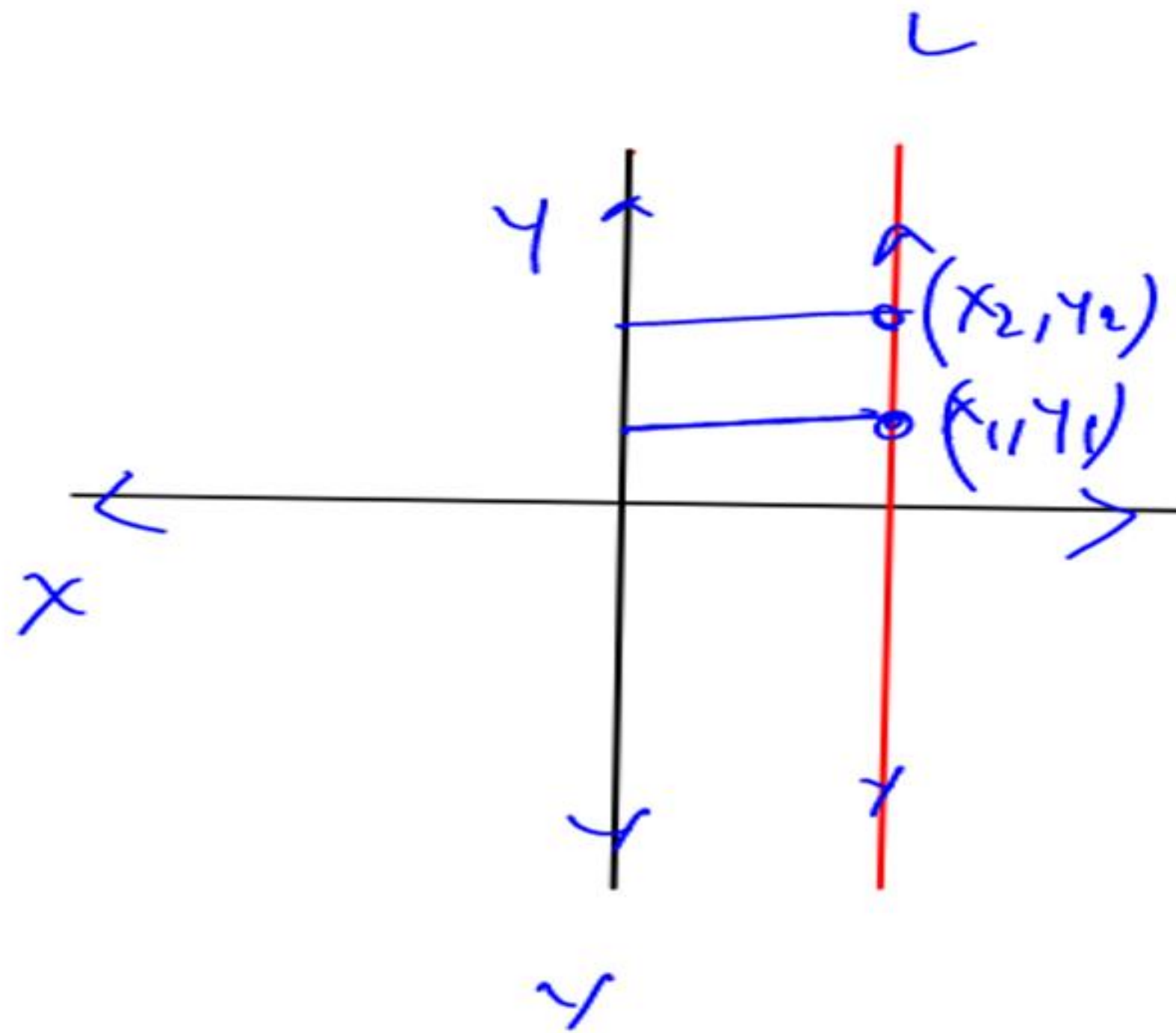
$$= \underline{\underline{0}}$$



$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= 0$$

Slope of a line parallel to y-axis or perpendicular to x-axis.



→ Not defined

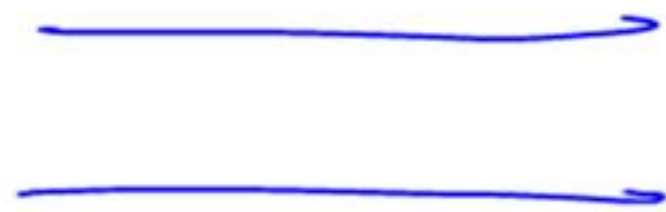
$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{\quad}{0}$$

Not defined

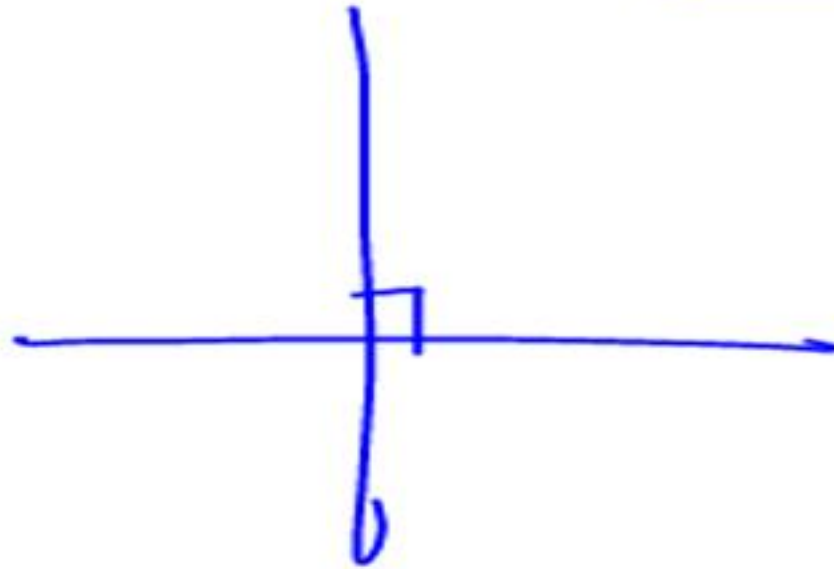
If 2 lines are parallel, then their slopes are equal:

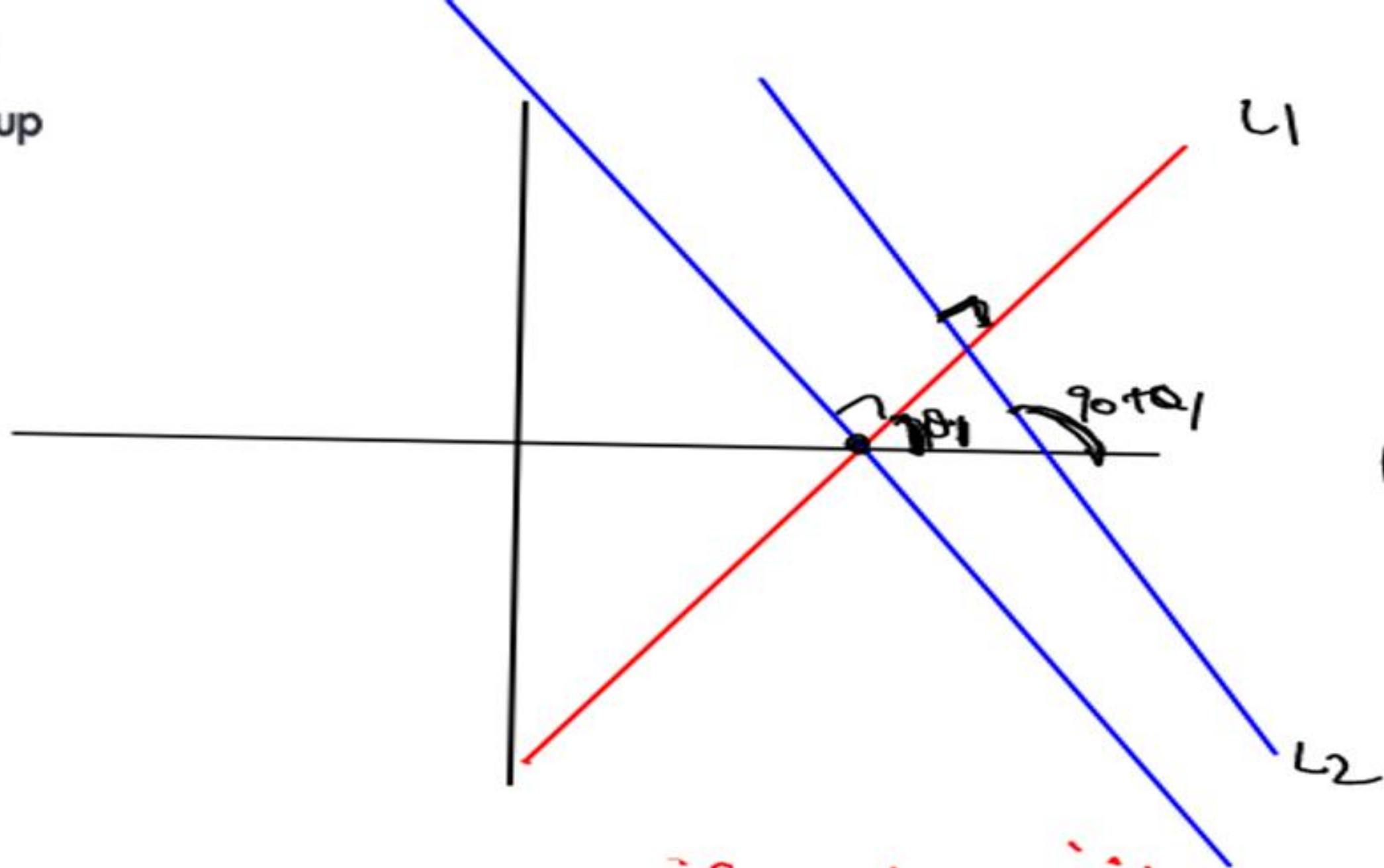
$$m_1 = m_2$$



If 2 lines are perpendicular, then product of their slopes is :

$$m_1 \cdot m_2 = -1$$





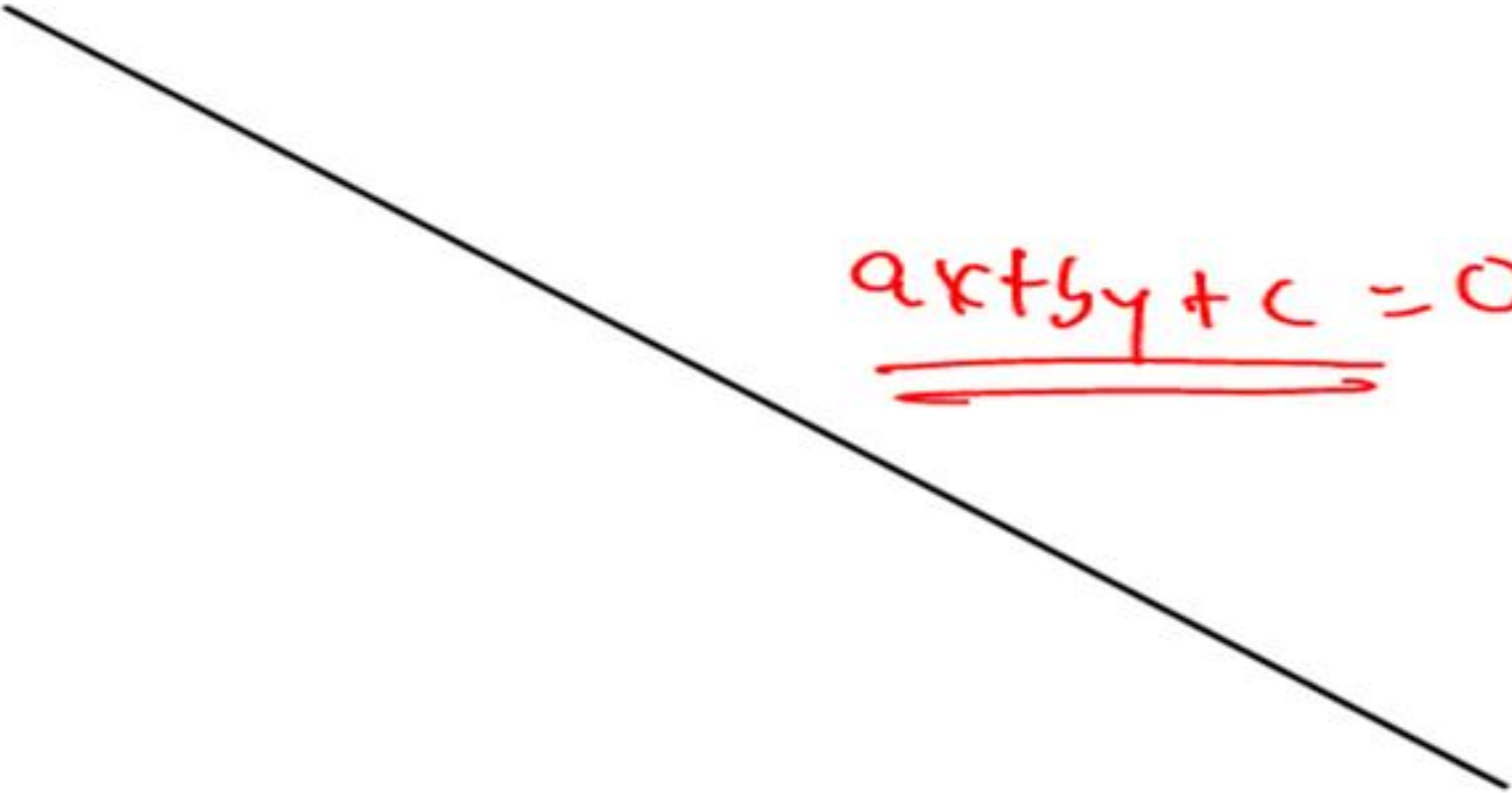
$$(\tan \theta_1) \tan(90 + \theta_1)$$

$$(\tan \theta_1) (-\cot \theta_1)$$

$$= -1$$

EQUATION OF LINE

$ax + by + c = 0$ (Linear equation in two variable)


$$\underline{ax + by + c = 0}$$

(1) Slope Intercept Form

Slope \checkmark
 $y \rightarrow$ Intercept \checkmark

$$Y = mx + c$$

m = Slope of a line

c = Y intercept

Intercept of a Line

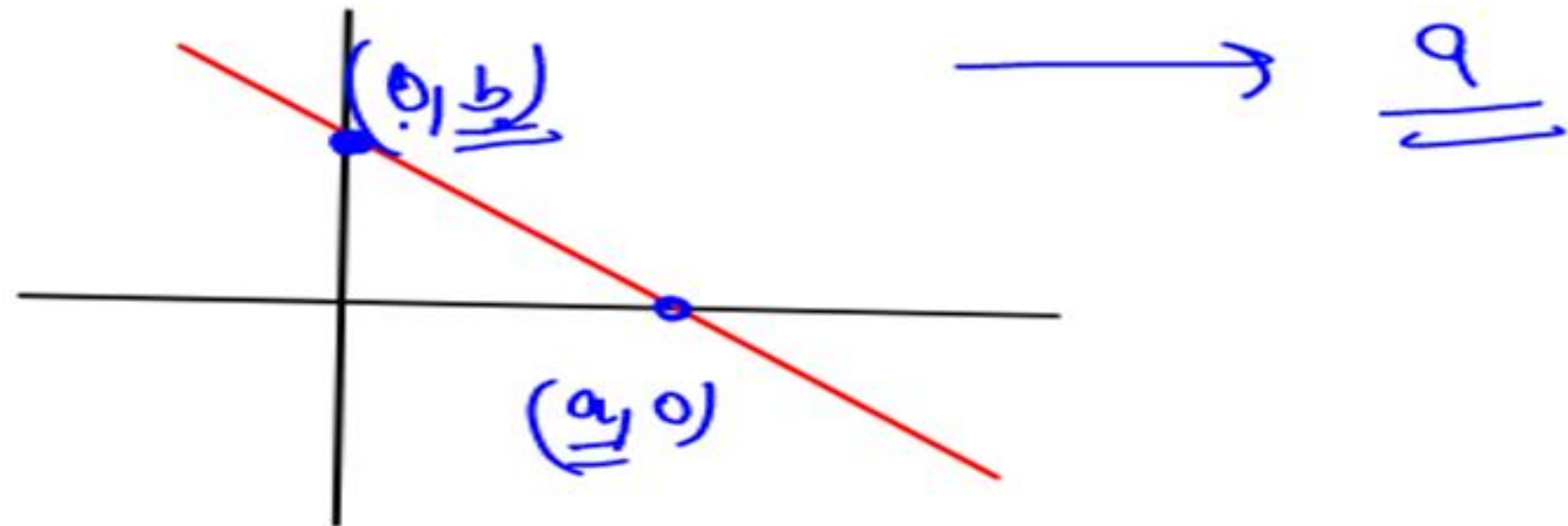
Y intercept

Y intercept of a line is the Y coordinate of a point where $X = 0$.

→ b

X intercept

X intercept of a line is the X coordinate of a point where $Y = 0$.



Eg. Write the equation of a line whose slope is 5 and Y intercept is -2.

$$M = 5 \qquad C = -2$$

$$Y = mX + C$$

$$Y = 5x - 2$$

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

Eg.

$$5x - 3y = 30$$

Find :

- (i) Slope of a line
- (ii) Y intercept of a line
- (iii) X intercept of a line

Ist

$$5x - 3y = 30$$

$$y = mx + c$$

$$-3y = -5x + 30$$

$$y = \frac{5}{3}x - 10$$

slope $\frac{5}{3}$

Y intercept = -10

Ind

$$5x - 3y = 30$$

$$(i) \text{ slope} = - \frac{(\text{coeff of } x)}{(\text{coeff of } y)} = \frac{-5}{-3}$$

$$(ii) -3y = 30$$

$$y = -10$$

$$(iii) 5x = 30$$

$$x = 6$$

(2) Point Slope Form



m

$$y - y_1 = m (x - x_1)$$

Eg. Write the equation of a line whose slope is -2 and it passes through $(5, -3)$.

$$m = -2 \quad (5, -3)$$

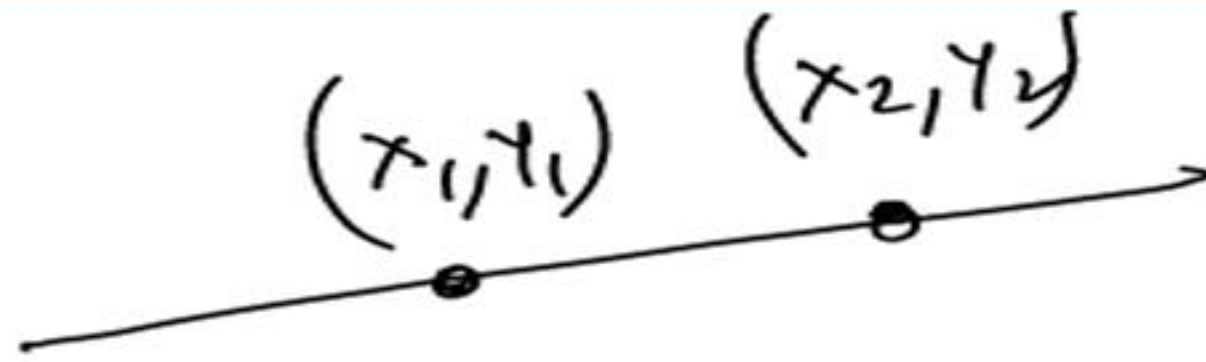
$$y - y_1 = m(x - x_1)$$

$$y + 3 = -2(x - 5)$$

$$2x + y = 7$$

$$\boxed{2x + y - 7 = 0}$$

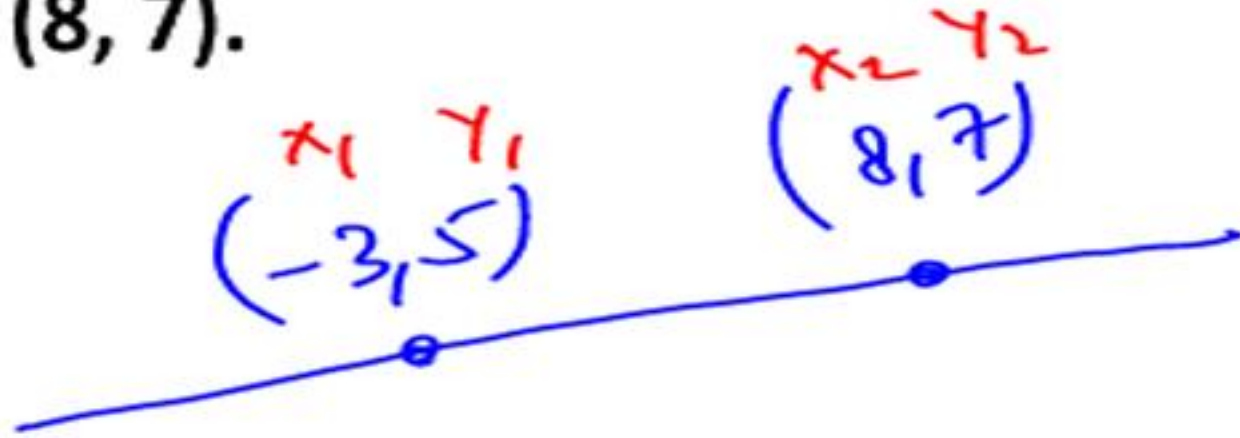
(3) Two-Point Form



$$y - y_1 = m(x - x_1)$$

$$y - y_1 = \left(\frac{y_2 - y_1}{x_2 - x_1} \right) (x - x_1)$$

Eg. Write the equation of a line which passes through $(-3, 5)$ & $(8, 7)$.



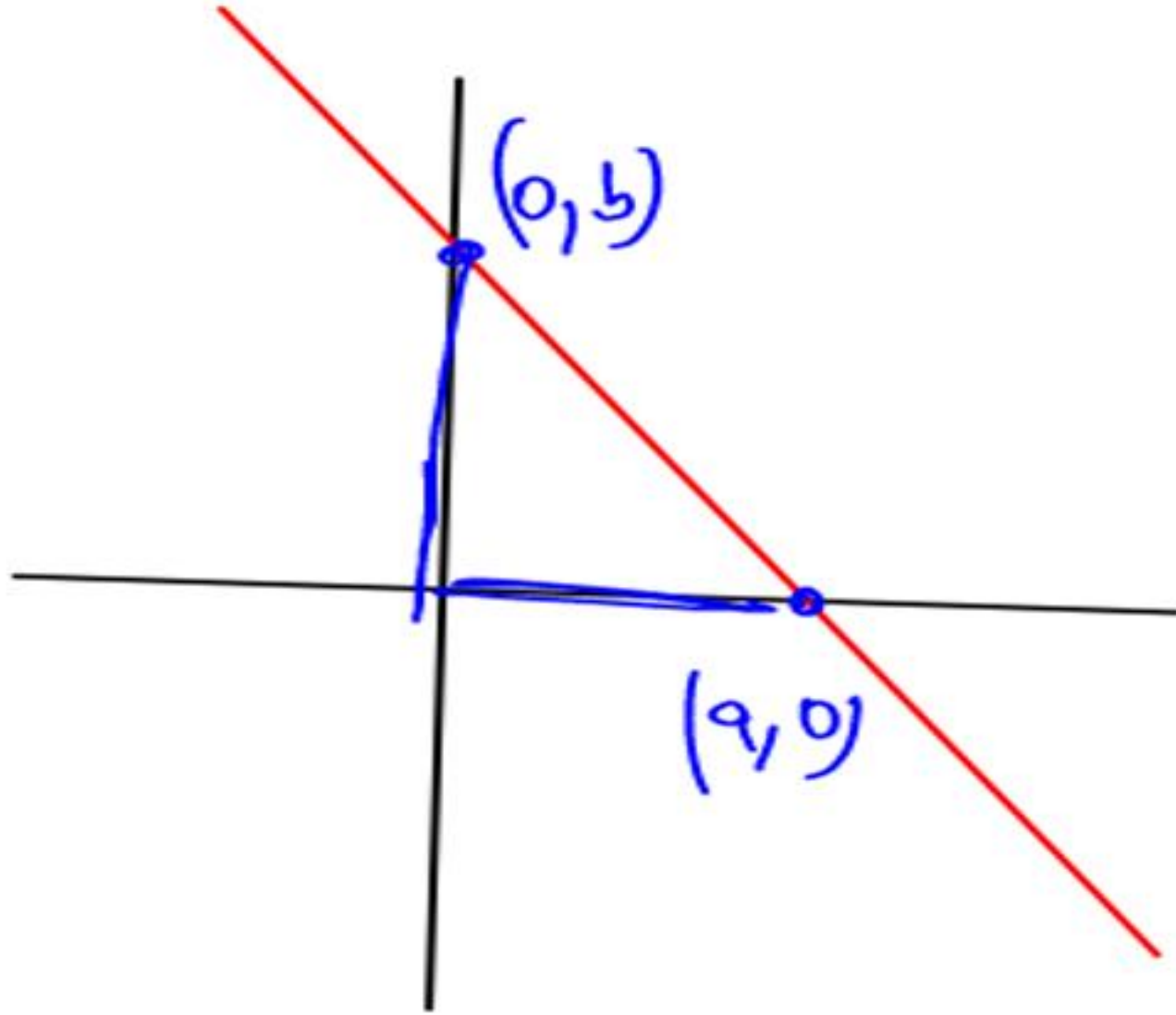
$$y - 5 = \frac{7 - 5}{8 + 3} (x + 3)$$

$$11y - 55 = 2x + 6$$

$$\boxed{2x - 11y + 61 = 0}$$

Ans. $2x - 11y + 61 = 0$

INTERCEPT FORM OF A LINE



X intercept = a

Y intercept = b

$$\frac{x}{a} + \frac{y}{b} = 1$$

Eg. Write the equation of a line whose
X intercept = 5 & Y intercept = -4.

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\frac{x}{5} + \frac{y}{(-4)} = 1$$

$$4x - 5y = 20$$

$$\boxed{4x - 5y - 20 = 0}$$

Ans. $4x - 5y - 20 = 0$

SOME BASIC POINTS REGARDING EQUATION OF LINE

Equation of x-axis :

$$\underline{y = 0}$$

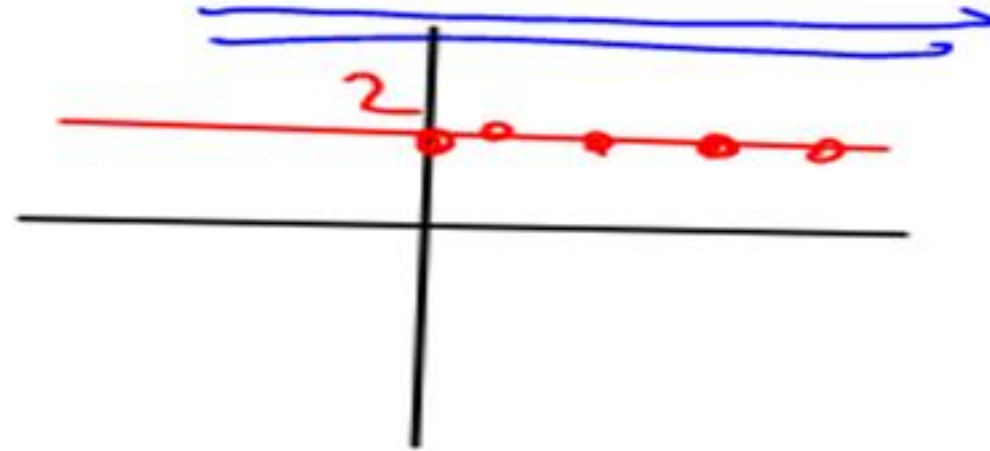
Equation of y-axis :

$$\underline{x = 0}$$

Equation of line parallel to x-axis

:

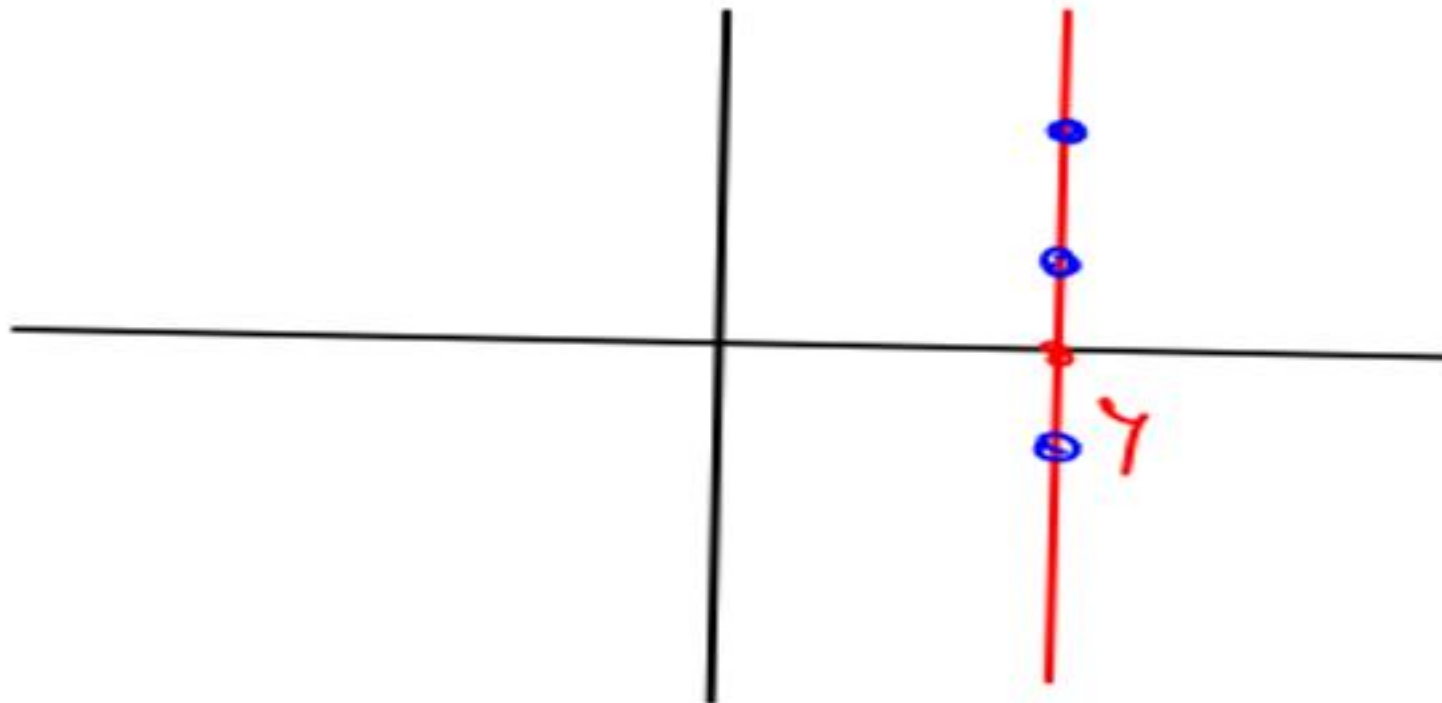
$$y = k$$



Equation of line parallel to y-axis

:

$$x = k$$



Equation of a line (L) : $ax + by + c = 0$

The equation of a line || to L

$$ax + by + k = 0$$

The equation of a line \perp to L

$$bx - ay + k = 0$$

Eg. Equation of a line L is $5x - 3y + 8 = 0$

(i) Equation of a line \parallel to L is :

$$5x - 3y + K_1 = 0$$

(ii) Equation of a line \perp to L is :

$$3x + 5y + K_2 = 0$$

AREA OF TRIANGLE

If the coordinates of the three vertices of triangle ABC are :

A (x_1, y_1) , B (x_2, y_2) and C (x_3, y_3)

$$\frac{1}{2} \left| x_1 y_2 - y_3 + x_2 y_3 - y_1 + x_3 y_1 - y_2 \right|$$

