DAY 33

MCA CET 2025

MATHS

STRAIGHT LINES

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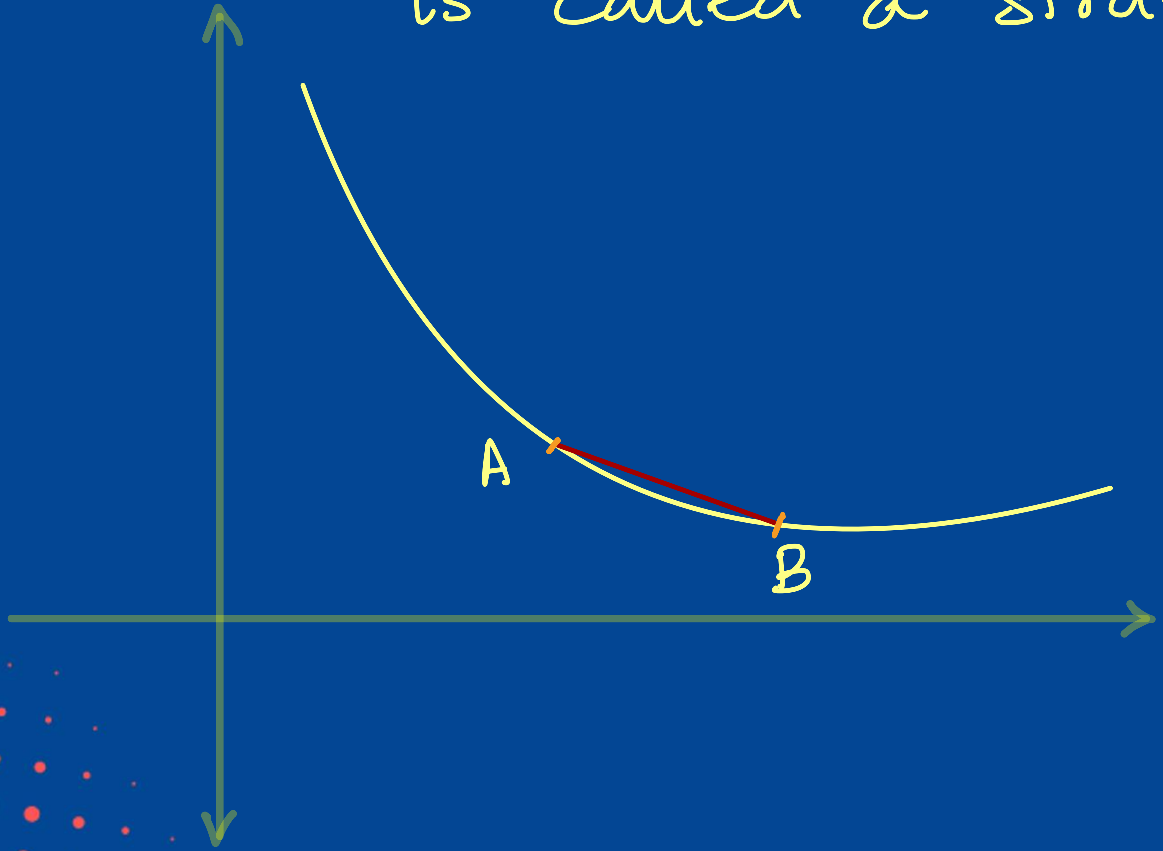
The shortest curve between two points is called a straight line segment

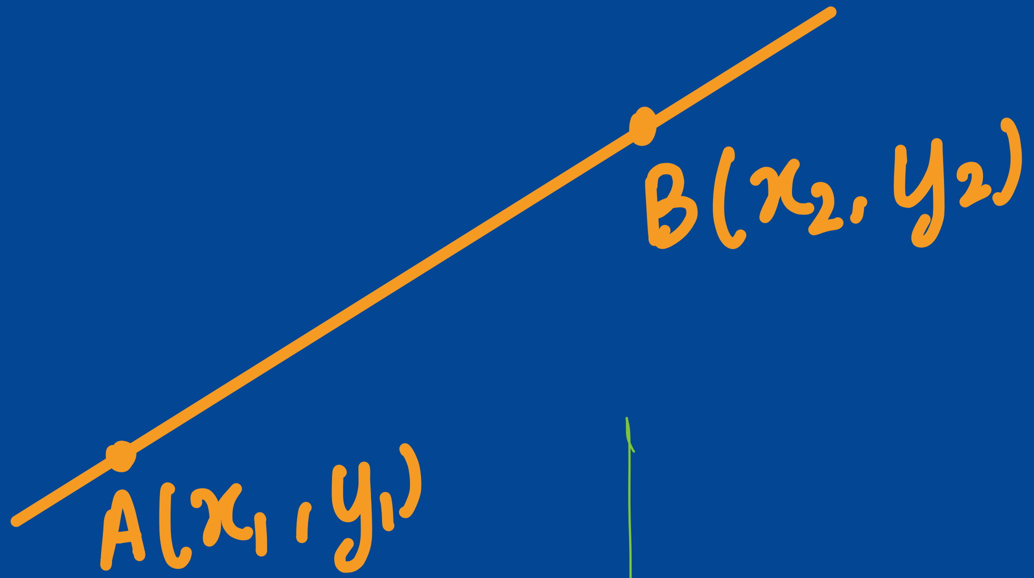


line = infinite

seg = finite

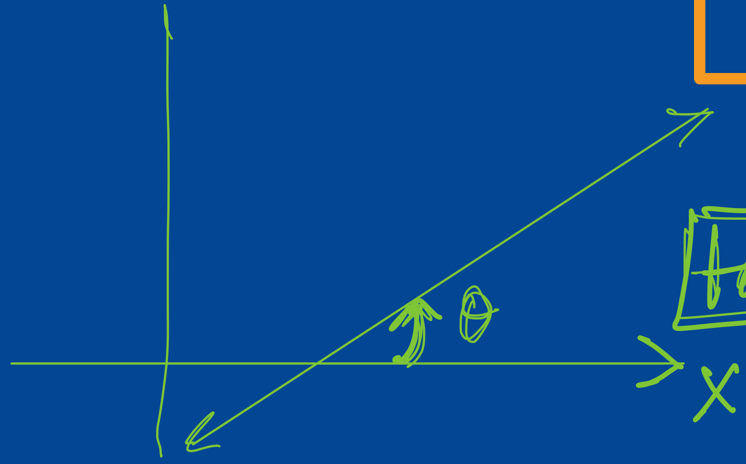
EQUATION OF STRAIGHT LINE

TWO POINT FORM



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

slope (m)



$\boxed{\tan\theta = m}$

$$\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1} \Rightarrow \frac{y}{x} = \frac{-4}{3}$$

$$3y = -4x$$

$(3, -4)$ (x_2, y_2)

$(0, 0)$ (x_1, y_1)

The equation of the straight line joining the origin to the point of intersection of y - x +7 = 0 and y + 2x – 2 = 0 is

(a) 3x + 4y = 0

(b) 3x - 4y = 0

(c) 4x - 3y=0

(d) 4x + 3y = 0

$$\boxed{4x+3y=0}$$

$$x - \cancel{y} = 7$$

$$+\ 2x + \cancel{y} = 2$$

$$3x = 9$$

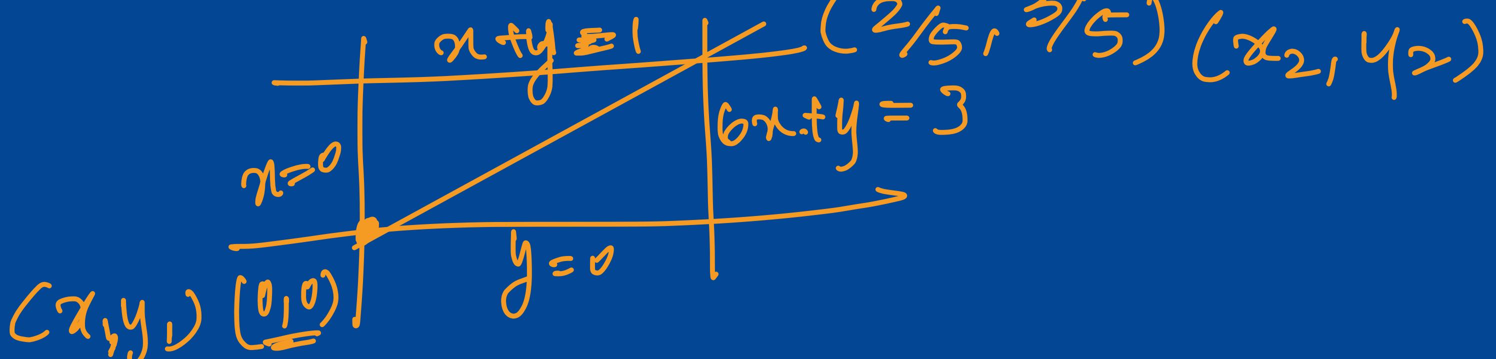
$$\boxed{x = 3}$$

$$\Rightarrow 3 - y = 7$$

$$-y = 7 - 3$$

$$-y = 4$$

$$\boxed{y = -4}$$



The diagonal passing through the origin of a quadrilateral form formed by $x=0$, $y=0$, $x + y = 1$ and $6x + y = 3$, is

(a) $3x - 2y = 0$

(b) $2x - 3y = 0$

(c) $3x + 2y = 0$

(d) None of these

$$x + y = 1 \Rightarrow \frac{2}{5} + y = 1$$

$$y = 1 - \frac{2}{5} = \frac{3}{5}$$

$$6x + y = 3$$

$$5x = 2$$

$$x = 2/5$$

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{y}{x} = \frac{3/5}{2/5}$$

$$2y = 3x$$

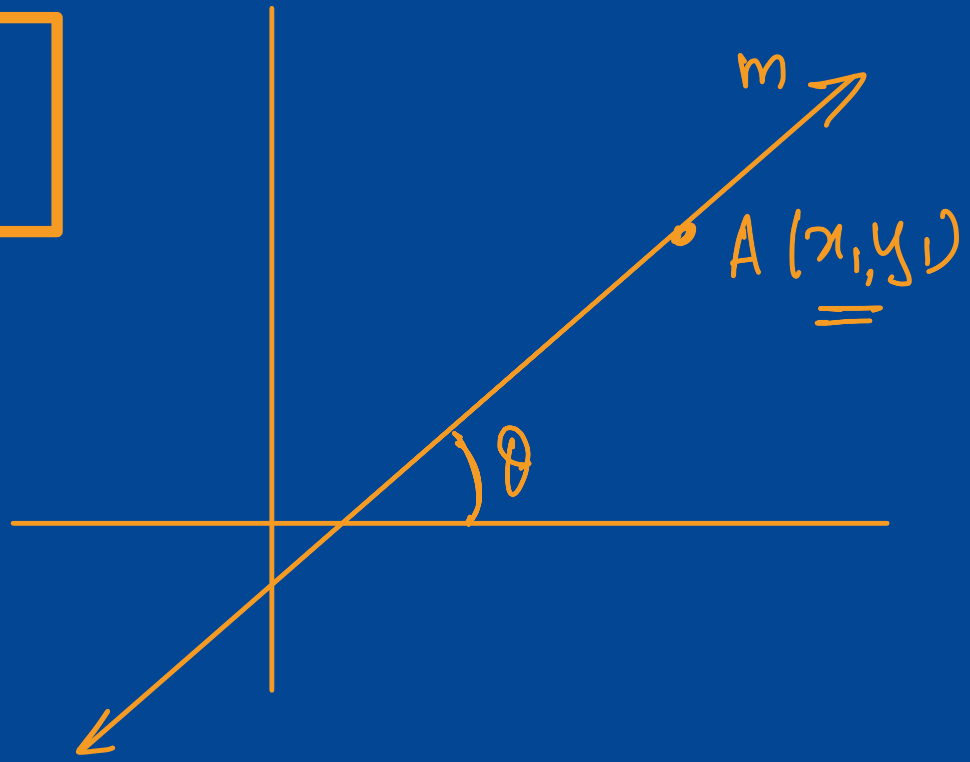
$$\boxed{3x - 2y = 0}$$

POINT SLOPE FORM

$$\boxed{(y-y_1) = m(x-x_1)}$$

$$\frac{y-y_1}{x-x_1} = m$$

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

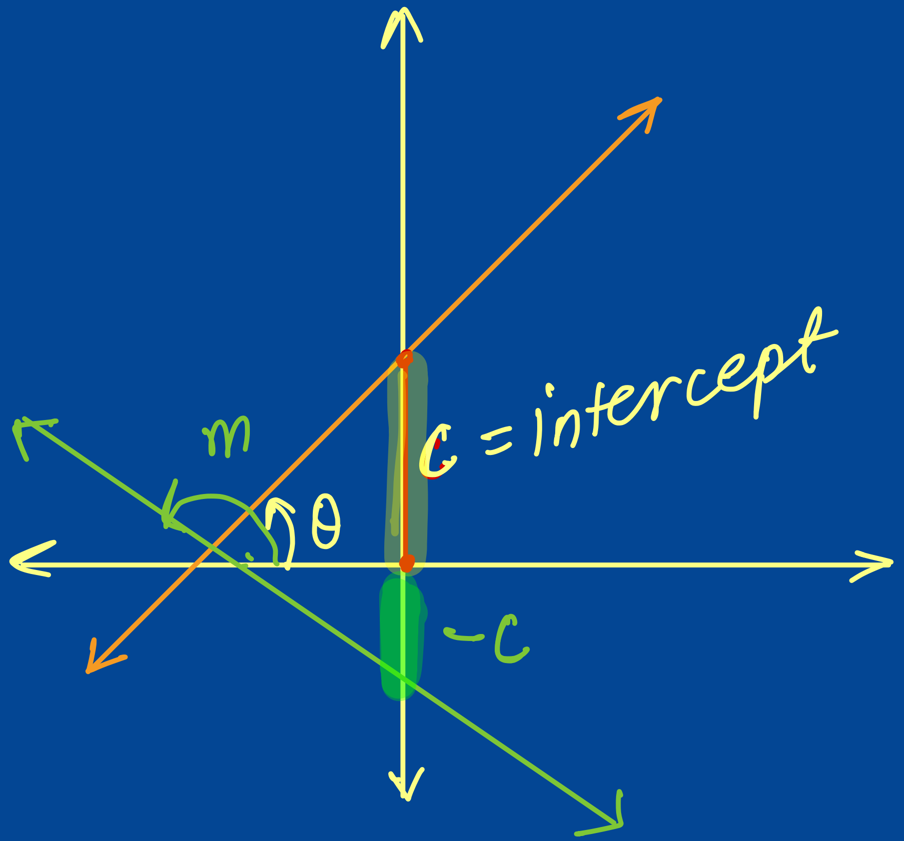


SLOPE INTERCEPT FORM

$$\boxed{y = mx + c}$$

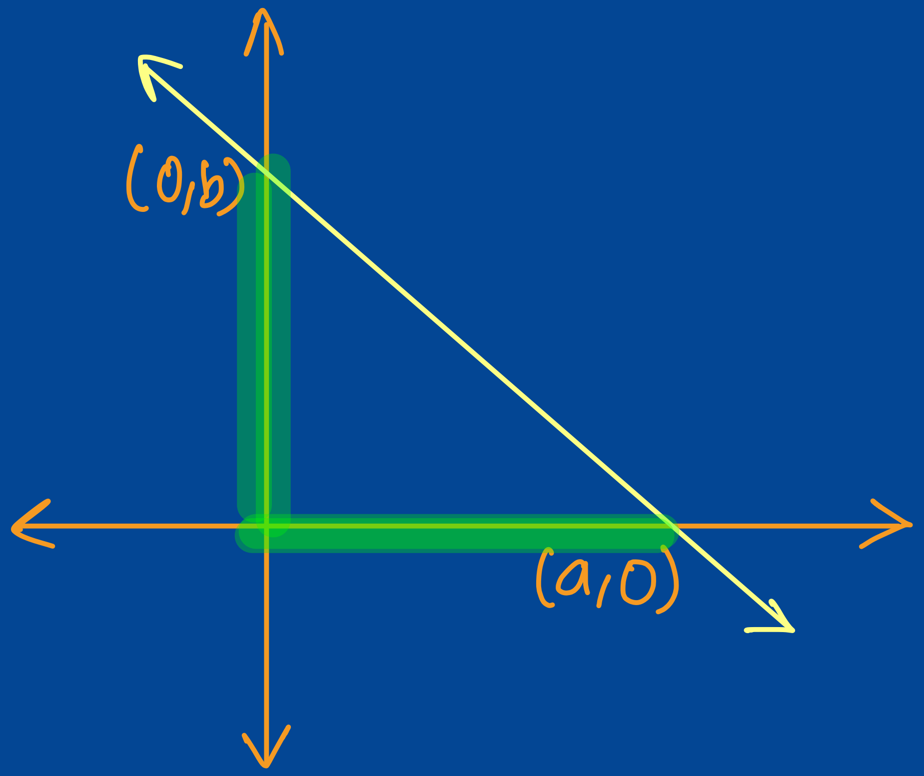
$$\text{slope} = \tan\theta$$

$$y = mx - c$$



INTERCEPT FORM

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

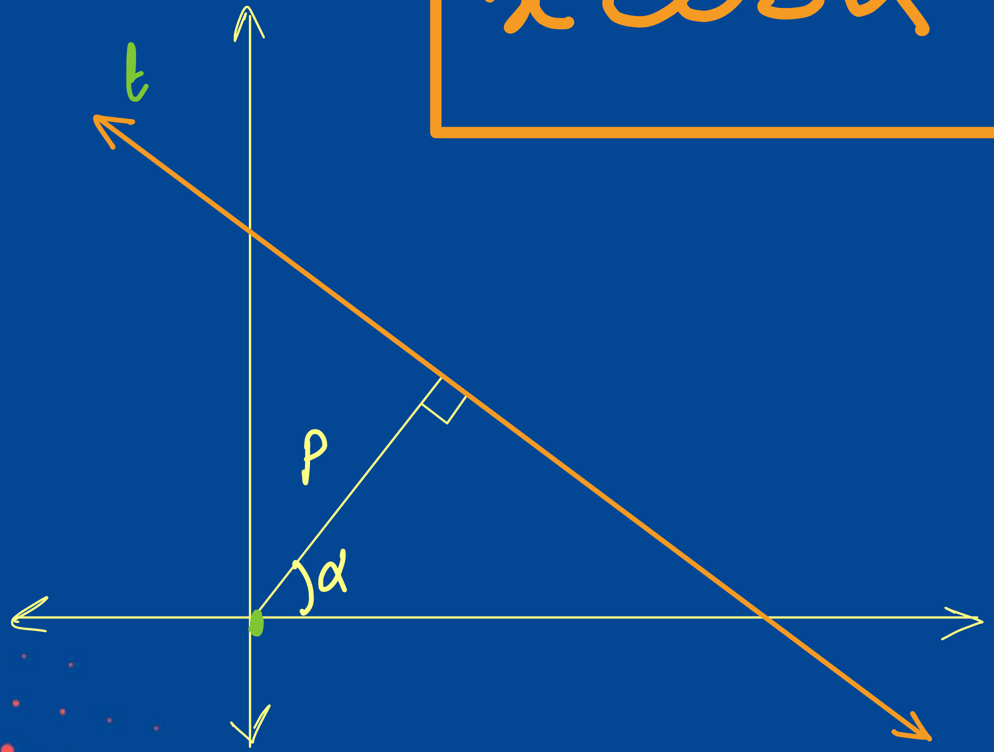


STANDARD FORM

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

NORMAL FORM

$$\boxed{x\cos\alpha + y\sin\alpha + p = 0}$$



SOME IMPORTANT CONDITIONS

$L_1 \Rightarrow ax + by + c = 0 \implies$ slope $= m$

$y = \boxed{\dfrac{-a}{b}}x - \dfrac{c}{b}$

① $L_1 \parallel L_2 \implies L_2 \Rightarrow ax + by + c_1 = 0$

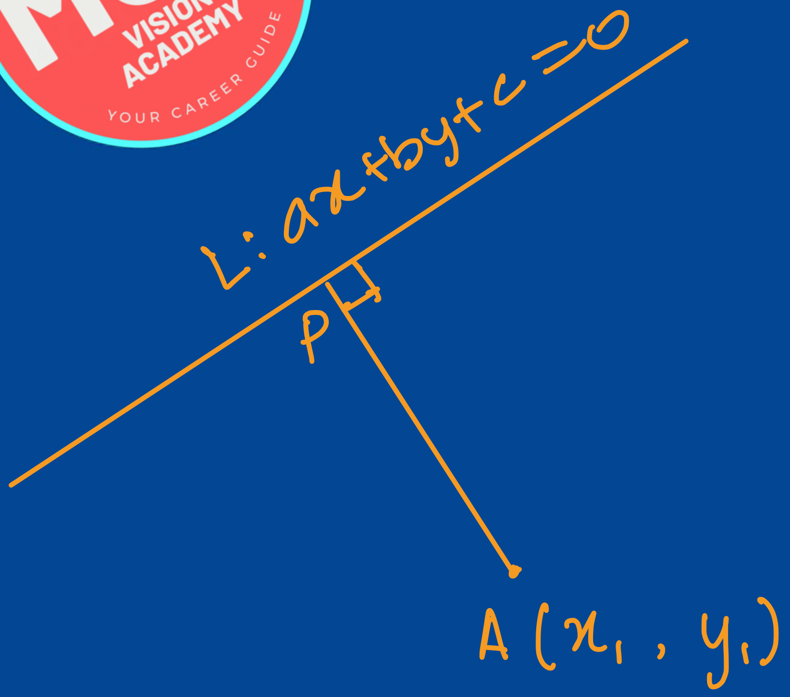
② $L_1 \perp L_2 \implies L_2 \Rightarrow \underline{bx - ay} + c_1 = 0$

$bx + c_1 = ay$

$y = \boxed{\dfrac{b}{a}}x + c_1$

$L_1 \perp L_2 \implies$ slope $= -\dfrac{1}{m}$

DISTANCE B/N A LINE AND A POINT



$$AP = \left| \frac{ax_1 + by_1 + c}{\sqrt{a^2+b^2}} \right|$$

$x - y = 5$

$(-2, 3)$

$x - y - 5$

a b

The distance of the point (-2, 3) from the line x – y = 5 is

(a) 5√2

(b) 2√5

(c) 3√5

(d) 5√3

$$\text{distance} = \left| \frac{-2-3-5}{\sqrt{1+1}} \right| = \left| \frac{-10}{\sqrt{2}} \right|$$

$$= \frac{10}{\sqrt{2}} = \frac{10\sqrt{2}}{\sqrt{2}\times\sqrt{2}} = \frac{\cancel{10}^{\,5}}{\cancel{2}}\sqrt{2}$$

$$= 5\sqrt{2}$$

DISTANCE B/N TWO PARALLEL LINES

$L_1: \; ax + by + c_1 = 0$

$L_2: \; ax + by + c_2 = 0$

$$d = \left| \frac{c_1 - c_2}{\sqrt{a^2 + b^2}} \right|$$

The distance between 4x + 3y = 11 and 8x + 6y = 15 is

(a) 7/2

(b) 4

(c) 7/10

(d) None of these

$$\frac{8x}{2} + \frac{6y}{2} = \frac{15}{2}$$

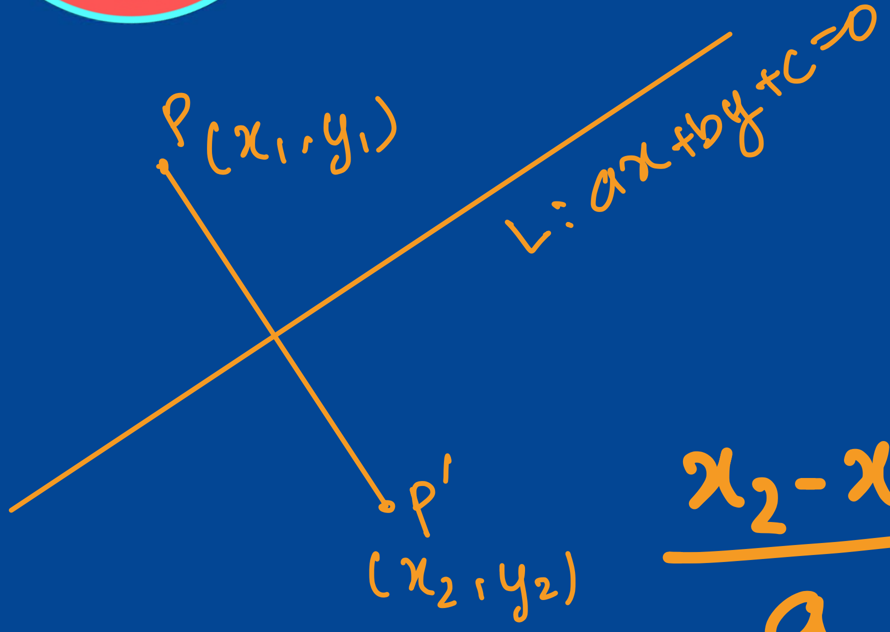
$$4x + 3y = \frac{15}{2}$$

$$\left| \frac{11 - \frac{15}{2}}{\sqrt{4^2 + 3^2}} \right| = \left| \frac{\frac{22-15}{2}}{\sqrt{25}} \right|$$

$$16 + 9$$

$$= \frac{7}{2 \times 5} = \frac{7}{10}$$

MIRROR IMAGE OF A POINT W.R.T. A LINE.



$$\frac{x_2 - x_1}{a} = \frac{y_2 - y_1}{b} = \frac{-2(ax_1 + by_1 + c)}{a^2 + b^2}$$

$(4, -13)$

$5x + y + 6 = 0$

(x_2, y_2)

The reflection of the point (4, -13) in the line 5x + y + 6 = 0 is

$\boxed{\text{(a) } (-1, -14)}$

(b) (3, 4)

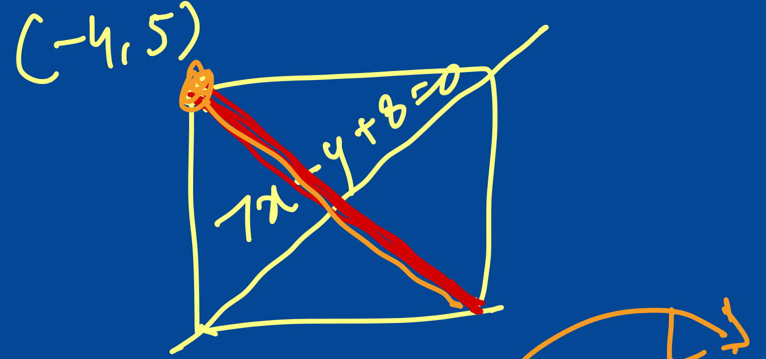
(c) (1, 2)

(d) (-4, 13)

$$\boxed{\frac{x_2 - x_1}{a}} = \frac{y_2 - y_1}{b} = \frac{-2(20 - 13 + 6)}{25 + 1}$$

$$= \frac{-2 \times 13}{26} = -1$$

$$\frac{x_2 - 4}{5} = -1 \qquad -5 + 4 = \boxed{-1}$$



① $L_1 \Rightarrow$ slope $= m$

$L_2 \Rightarrow -\frac{1}{m}$

Point slope form.

If (- 4, 5) is one vertex and 7x - y + 8 = 0 is one diagonal of a square, then the equation of second diagonal is

(a) x + 3y =21

(c) x + 7y = 31

(b) 2x- 3y = 7

(d) 2x + 3y = 21

$7x + 8 = y$

$m = 7$

$m = -\frac{1}{7}$

② Reflection point

Two point form

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

$y - 5 = -\frac{1}{7}(x + 4)$

$7y - 35 = -x - 4$

$x + 7y = -4 + 35$

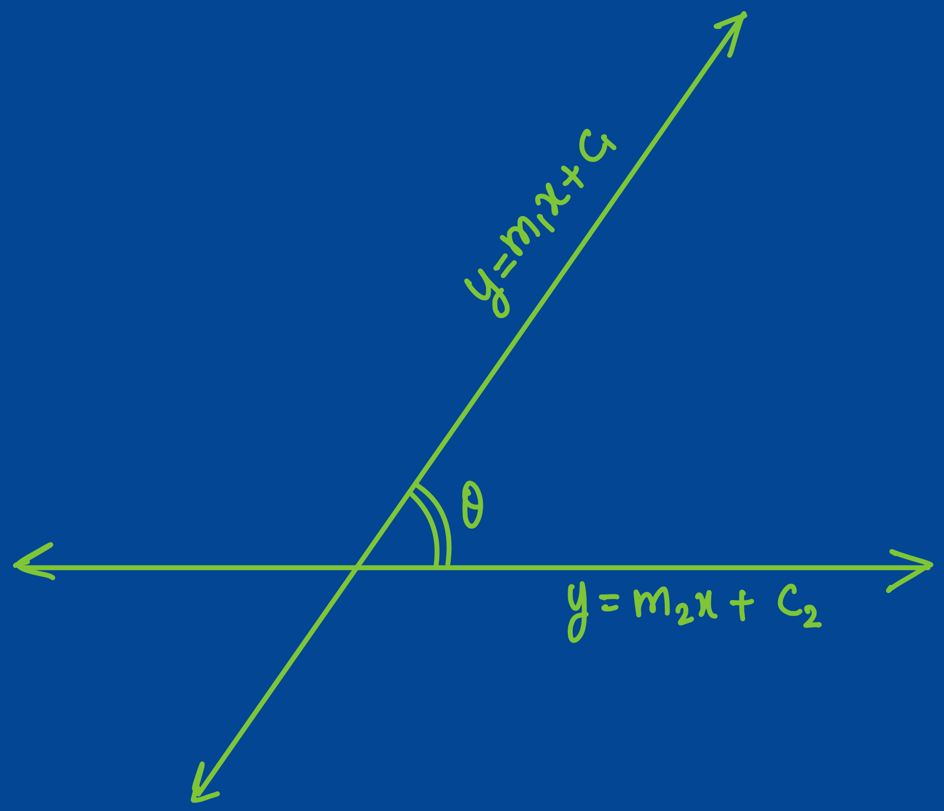
$x + 7y = 31$

ANGLE BETWEEN TWO LINES

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$

$L_1 : y = m_1 x + c_1$

$L_2 = y = m_2 x + c_2$



$2y = -x - 3$

$y = -\frac{1}{2}x - \frac{3}{2}$

$m_2 = -\frac{1}{2}$

The angle between the lines $2x - y + 3 = 0$ and $x + 2y + 3 = 0$ is

$m \quad -\frac{1}{m}$

~~(a)~~ 90°

(b) 60°

(c) 45°

(d) 30°

$y = 2x + 3$

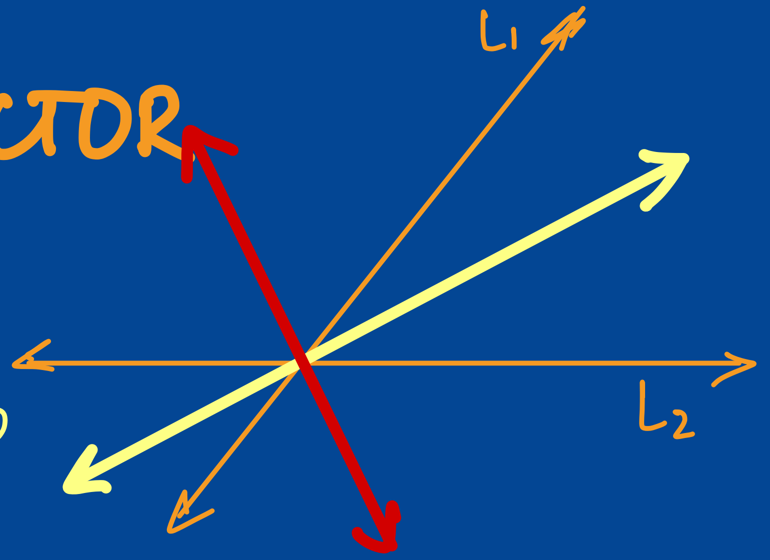
$\boxed{m_1 = 2}$

undef.

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right| = \left|\frac{2 + \frac{1}{2}}{1 + \left[2 \times -\frac{1}{2}\right]}\right| = \left|\frac{\frac{5}{2}}{0}\right|$$

$\tan\theta = 90°$

EQN. OF ANGLE BISECTOR

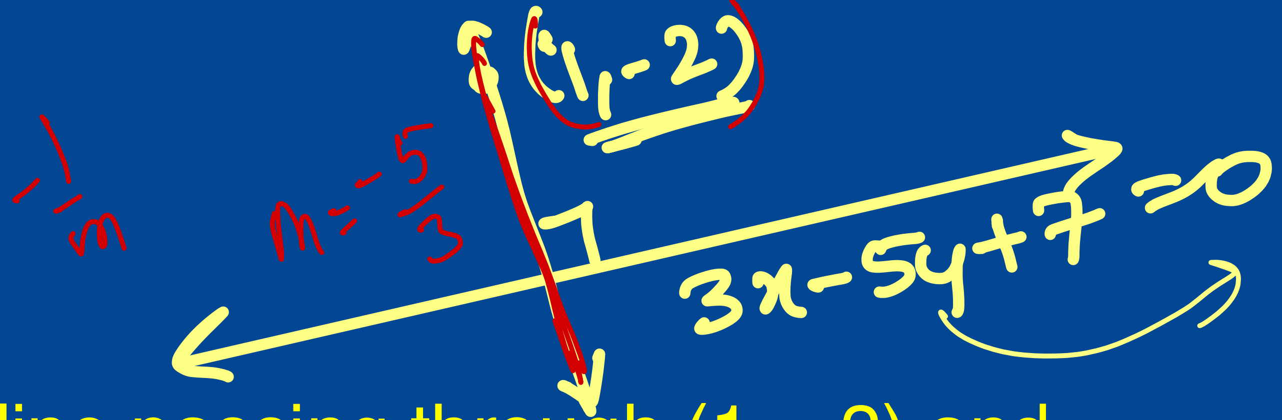


$L_1 : a_1x + b_1y + c_1 = 0$

$L_2 : a_2x + b_2y + c_2 = 0$

$$\left|\frac{a_1x + b_1y + c_1}{\sqrt{a_1^2 + b_1^2}}\right| = \left|\frac{a_2x + b_2y + c_2}{\sqrt{a_2^2 + b_2^2}}\right|$$

$$\pm$$



Equation of a line passing through (1, - 2) and perpendicular to the line 3x - 5y + 7 = 0 is

(a) 5x + 3y + 1 = 0

(b) 3x +5y+1 = 0

(c) 5x - 3y - 1 = 0

(d) 3x - 5y + 1 = 0

$3x + 7 = 5y$

$\frac{3}{5}$

$m = \frac{3}{5}$

$(y+2) = -\frac{5}{3}(x-1)$

$3y + 6 = -5x + 5$

$5x + 3y = -1$

$5x + 3y + 1 = 0$

STRAIGHT LINES advanced

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