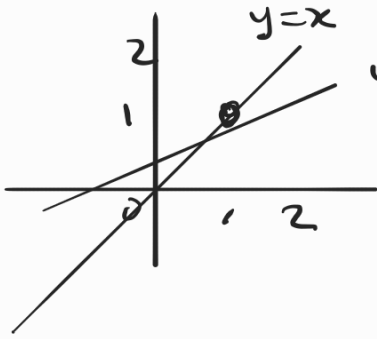


Maths 05 - Equations of a straight line

Review

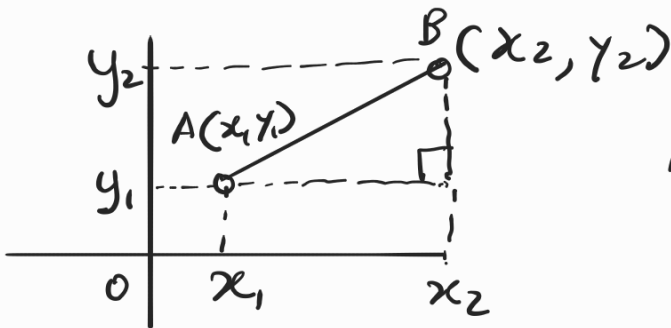
① straight line is a linear equation with 2 unknowns (eg. x, y)



e.g. For $y = x$, or $y - x = 0$
it passes through $(1, 1)$

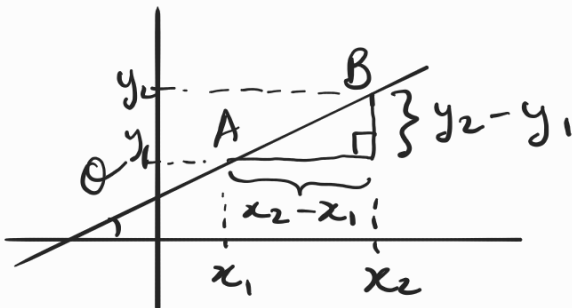
(x, y)

□
② Distance between 2 points (distance formula)



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

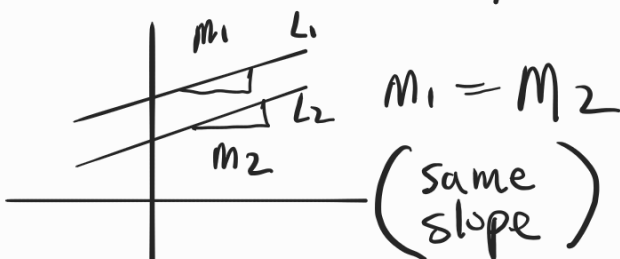
③ Slope and Inclination



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

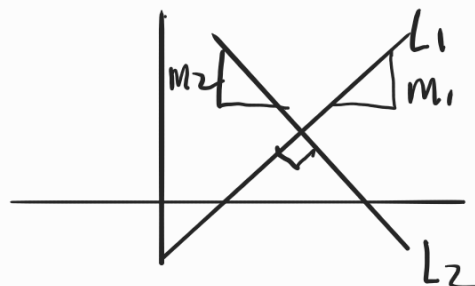
$$\text{angle: } \tan \theta = m$$

④ Parallel and Perpendicular lines



$$m_1 = m_2$$

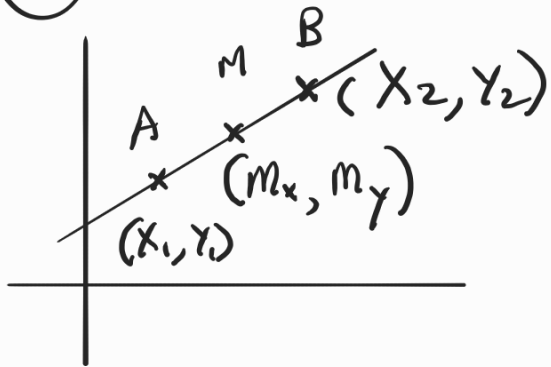
(same slope)



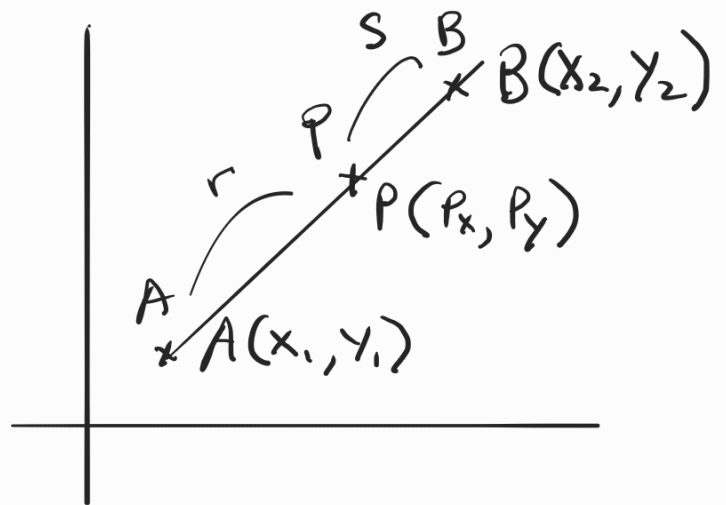
$$m_1 m_2 = -1$$

(product is -1)

(E) Points of Division



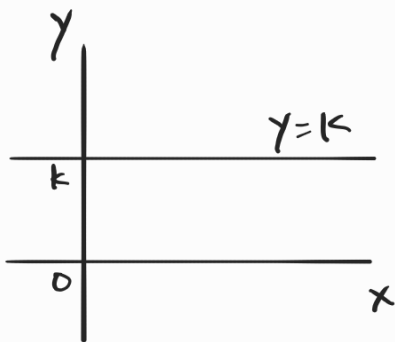
$$M = (m_x, m_y) \\ = \left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right]$$



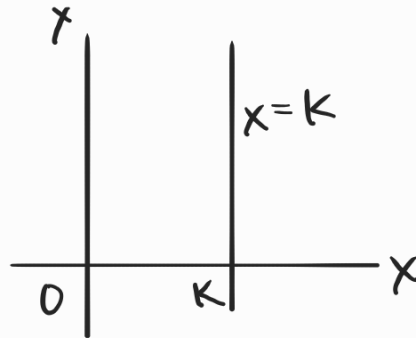
$P(p_x, p_y)$ divides AB in ratio $r:s$

$$P = (p_x, p_y) = \left[\frac{rx_2 + sx_1}{r+s}, \frac{ry_2 + sy_1}{r+s} \right]$$

Special Forms of Straight Lines



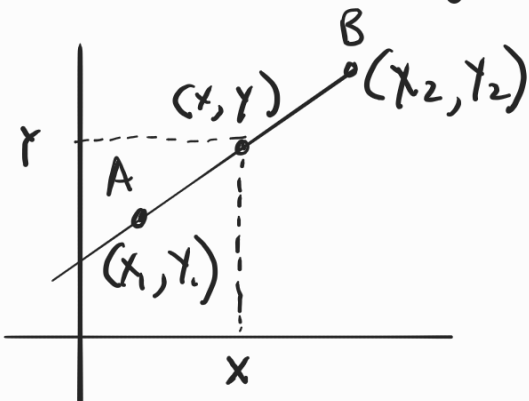
Horizontal
Line



Vertical
Line

①

Determine a straight Line from 2 points



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

Form equation of straight line
 x, y

Example: A straight line passes through (2,7) and (4,9)

$$\text{equation} \Rightarrow \frac{y-7}{x-2} = \frac{9-7}{4-2}$$

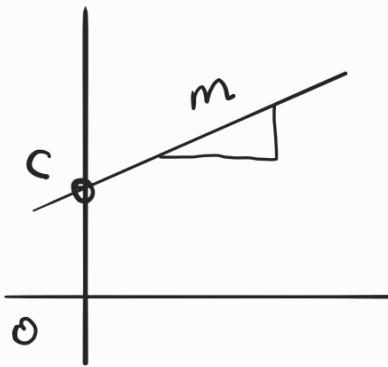
$$\Rightarrow y-7 = x-2 \quad \underline{y = x+5}$$

(2)

Determine the equation by one point and slope

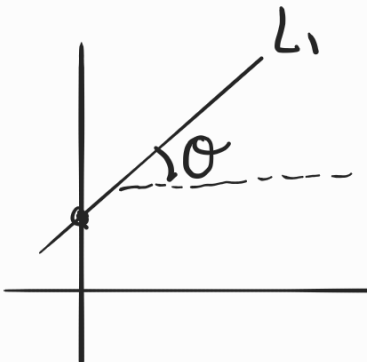
$$y - y_1 = m(x - x_1)$$

(3) Determine the equation by y-intercept and slope



$$y = mx + c$$

(3.5) Determine the slope by angle θ



$$m = \tan \theta$$

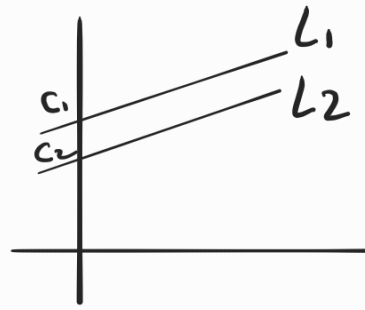
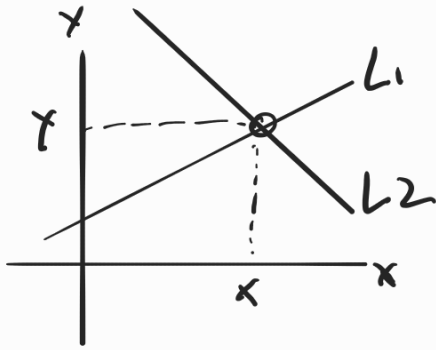
$$\text{e.g. If } \theta = 60^\circ \Rightarrow \tan \theta = \sqrt{3}$$

$$L_1 \text{ equation} \Rightarrow y = \sqrt{3}x + c$$

General form of Straight Line Equation

$$Ax + By + C = 0, \text{ where } A, B \text{ cannot both be } 0$$

Point of intersection of 2 straight lines



- No intersection
- Same Slope m
- $c_1 \neq c_2$
- No solution

L_1, L_2 have different slopes
 (x, y) point of intersection

Ex: $L_1: x - 2y - 4 = 0$; $L_2: 2x - 3y + 5 = 0$

Find the point of intersection

Solution: $x - 2y - 4 = 0$ ----- (1)
 $2x - 3y + 5 = 0$ ----- (2)

From (1)

$$x = 2y - 4$$

Substitute into (2)

$$2(2y - 4) - 3y + 5 = 0$$

$$4y - 8 - 3y + 5 = 0$$

$$y = 3$$

$$x = 2$$

(put $y=3$ into (1) or (2))

END $\hat{\Sigma}$