

## - 2.5 Equations of lines -

2.5 (P1)

### Objectives.

- To find the eq<sup>n</sup> of a line from the slope & a point or the slope and its x-intercept.
- Parallel & Perpendicular lines.

### Point-Slope form.

The point-slope form of the equation of a line with slope  $m$  & passing through  $(x_1, y_1)$  is

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

Exp 1. Find eq<sup>n</sup> of line through  $(4, -7)$  & slope  $m = -2$ .

Exp 2. A line passes by  $(2, 3), (-1, 2)$   
Find its equation & put in standard form.

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

$$\text{eq}^n \rightarrow \boxed{y - 3 = \frac{1}{3}(x - 2)} \quad (\Rightarrow) \quad \begin{aligned} 3y - 9 &= x - 2 \\ \boxed{-x + 3y} &= +7 \end{aligned}$$

$$\text{or } \boxed{y = \frac{1}{3}x + \frac{7}{3}}$$

## Slope-Intercept form

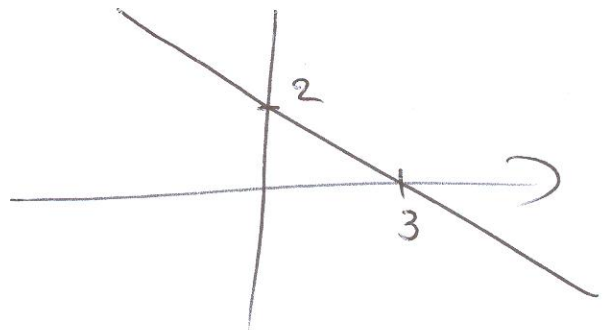
A line with slope  $m$  &  $y$ -intercept  $b$

has eq<sup>n</sup>  $\boxed{y = mx + b}$   $\rightarrow$  slope-intercept form.

Exp 3. Find slope & intercept of  $3x + 2y = 5$

Exp 4. Give the eq<sup>n</sup> in slope-intercept form of line passing through  $(1, 1)$ ,  $(2, 4)$

Exp 5. What is the eq<sup>n</sup> of



Sol<sup>n</sup>

$$y\text{-int} = 2 = b$$

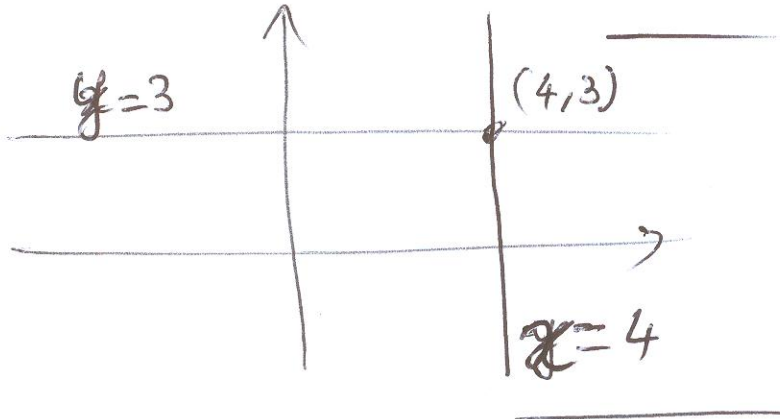
$$m = \frac{0 - 2}{3 - 0} = -\frac{2}{3}$$

$$\Rightarrow \boxed{y = \left(-\frac{2}{3}\right)x + 2}$$

$$\text{or } \boxed{2x + 3y = 6}$$

## Vertical & Horizontal lines

- A horizontal line passing by  $(a, b)$  has eq  $\boxed{y = b}$
- A vertical line passing by  $(a, b)$  has eq  $\boxed{x = a}$



## Parallel & Perpendicular lines.

Let  $L_1$  &  $L_2$  be lines with slopes  $m_1$  &  $m_2$ . Then

$L_1$  &  $L_2$  are parallel if  $m_1 = m_2$

$L_1$  &  $L_2$  are perpendicular if  $m_1 \cdot m_2 = -1$   
 (or  $m_2 = -\frac{1}{m_1}$ )

Exp 6: Write an eq<sup>n</sup> of a line such that

- the line passes by  $(3, -2)$  & parallel to  $2x - y = 5$
- the line passes by  $(4, -4)$  & perpendicular to  $2y + 5x = 1$
- " " " "  $(2, 3)$  & " " to  $x = 4$
- " " " "  $(-3, 2)$  & parallel to  $y = -5$

Ex 7. Find  $r$  so that the line through  $(2, 6)$  &  $(-4, r)$  is

a) parallel to  $2x - 3y = 4$

b) perpendicular to  $x + 2y = 1$