

P4: Lines in a Plane

- objectives:
 - find slope
 - pt. slope form / slope intercept form
 - find // and \perp lines

Slope: $\frac{\text{rise}}{\text{run}}, \frac{\Delta y}{\Delta x}$ * slope intercept form

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad y = mx + b$$

Ex1 Find the slope: $(-1, 2), (4, -2)$

$$\frac{-2 - 2}{4 - (-1)} = \frac{-4}{5} \qquad \frac{2 - (-2)}{-1 - 4} = \frac{4}{-5}$$

$$m = -\frac{4}{5}$$

Ex2 Find the missing value
 $(x, 3), (5, 9), m = 2$

$$2 = \frac{9 - 3}{5 - x} \rightarrow 2 = \frac{6(5-x)}{5-x} \cdot \frac{1}{1}$$

$$\frac{2(5-x)}{2} = \frac{6}{2}$$

$$5 - x = 3$$

$$-3 + x = 3$$

$$\boxed{2 = x}$$

* Point-slope form:
 $(x_1, y_1), m$
 $y - y_1 = m(x - x_1)$

Ex. Find the equation of the line through $(-3, -4)$ and slope of 2.

$$y + 4 = 2(x + 3)$$

$$y + 4 = 2x + 6$$

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

$y = mx + b$
 $-4 = 2(-3) + b$
 $-4 = -6 + b$
 $+6 + b$
 $2 = b$
 $y = 2x + 2$

Ex. Find eq. slope 3, $(-3, 4)$

$$y = 3x + 13$$

Parallel Lines: same slope

Perpendicular Lines: opposite reciprocals

Ex Find the equation of a line through $(1, -2)$ and // to

$$3x + 2y = 1$$

$$-3x \quad -3x \qquad m = -\frac{3}{2} \quad (1, -2)$$

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

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

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

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

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

Ex: Find line \perp to $y = -4x + 3$ through $(2, -3)$

$$m = \frac{1}{4} \quad (2, -3)$$

$$y + 3 = \frac{1}{4}(x - 2)$$

$$y + 3 = \frac{1}{4}x - \frac{1}{2}$$

$$-3 \quad -\frac{1}{2}$$

$$\boxed{y = \frac{1}{4}x - 3\frac{1}{2}}$$

$$-3.5 \quad -\frac{7}{2}$$

Vertical Line: $x = a$

Horizontal Line: $y = b$

General Form: $Ax + By + C = 0$