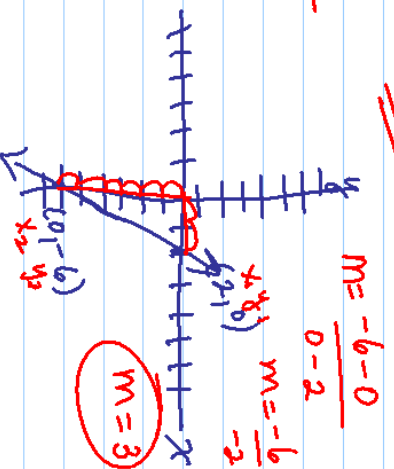
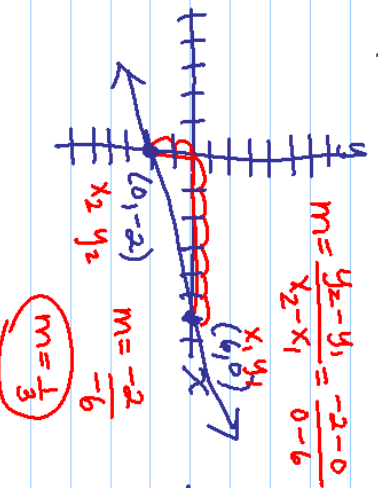


# Slope of a Line

Def. Slope is a numerical value that measures the steepness of a line.

Compare these lines:

Constant



Slope is defined as the ratio of the rise to run as we move from one point on a line to another.

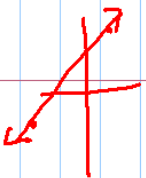
$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

where  $(\underline{x_1}, \underline{y_1})$  and  $(\underline{x_2}, \underline{y_2})$  are points on a graph.

Ex. Calculate the slope of the lines

1)  $(-5, 2)$  and  $(3, -7)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - 2}{3 - (-5)} = \frac{-9}{8}$$

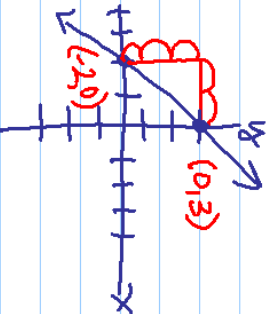


2)

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

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

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



3)  $(5, 1)$  and  $(-2, 1)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 1}{-2 - 5} = \frac{0}{-7} = 0$$

(horizontal)



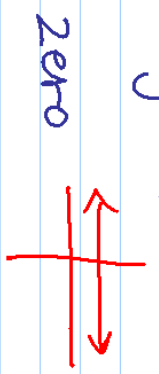
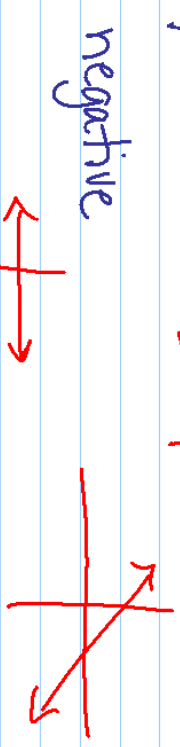
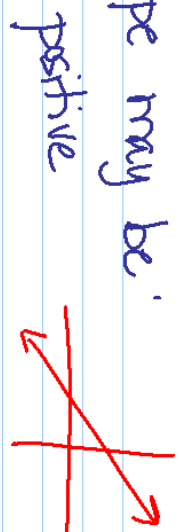
4)  $(3, 0)$  and  $(3, 4)$

$$m = \frac{4 - 0}{3 - 3} = \frac{4}{0}$$

undefined (vertical)



Slope may be:



Find slope given an equation.  $\Delta = \text{change}$   
in

$$y = 2x + 4$$

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$$

X	Y
-1	2
0	4
1	6

$$y = 2(-1) + 4$$
$$y = -2 + 4 = 2$$
$$y = 2(0) + 4$$
$$y = 4$$
$$y = 2(1) + 4$$
$$y = 2 + 4 = 6$$

$$y = mx + b$$

↑ slope (0, b)  
↑ y-int.

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

$$m = \frac{6-4}{1-0} = \frac{2}{1} = 2$$

Slope-Intercept Form

$$y = mx + b$$

Slope  $(0, b)$  ~~y~~-intercept

Find the slope & y-intercept of the eq.

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

$m = \frac{3}{2}$  rise/run  
 $b = -2 \Rightarrow (0, -2)$



②  $2x + y = 4$

$y = -2x + 4$

$m = -2 = \frac{-2 \text{ rise}}{1 \text{ run}}$

$b = 4 \Rightarrow (0, 4)$

$y = mx + b$   
 (begin inside)

③  $y = b \Rightarrow y = 0x + b$

$m = 0 = \frac{0 \text{ rise}}{1 \text{ run}}$

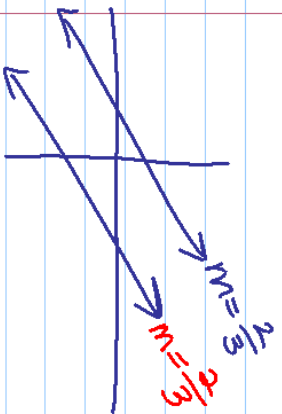
$b = b \Rightarrow (0, b)$

④  $x = -2$

vertical  
undefined slope

## Parallel & Perpendicular Lines

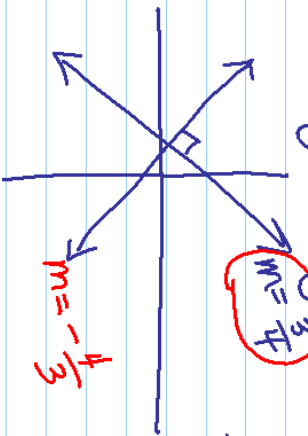
Parallel lines - lines that never intersect  
 $\Rightarrow$  same slope



Ex. write an example of  
a line parallel to  
 $y = -2x + 1$ .

$$y = -2x + 3$$

Perpendicular Lines  $\rightarrow$  lines that intersect at right angles



$\rightarrow$  slopes have a product of  $-1$

$\rightarrow$  slopes are negative reciprocals

Ex. write an eq. that is  $\perp$  to  $y = \frac{2}{3}x - 5$ .

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

Determine if the lines are parallel, perpendicular, or neither.

$$y = mx + b$$

①  $2x - y = 6$

$$x - 2y = 4$$

$$2x - y = 6$$

$$-y = \frac{-2x + 6}{-1}$$

$$y = 2x - 6$$

$$m = 2$$

neither

$$x - 2y = 4$$

$$-2y = -x + 4$$

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

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

②  $x + 4y = 8$

$$6x + 24y = 12$$

$$x + 4y = 8$$

$$4y = -x + 8$$

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

$$m = -\frac{1}{4}$$

parallel

$$6x + 24y = 12$$

$$24y = \frac{-6x + 12}{24}$$

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

$$m = -\frac{1}{4}$$