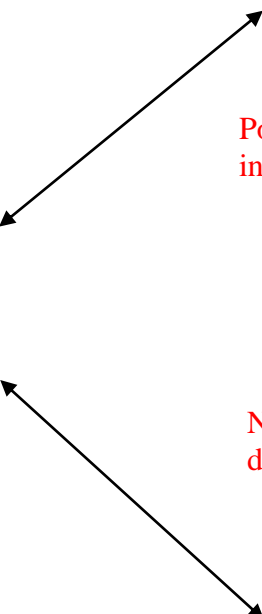
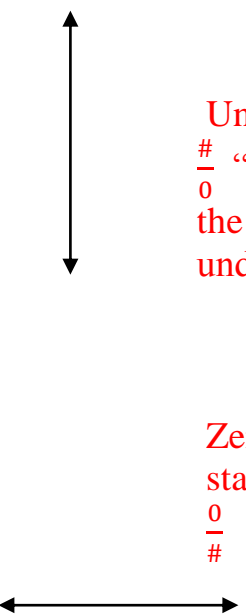


4.4: Find Slope and Rate of Change

Goals: *Find slope of a line given two points
*Find slope of a graphed line
*Find and interpret rate of change

Definition	Formulas								
<p><u>SLOPE</u> -</p> <p>The ratio of vertical change to horizontal change of a line</p> <p><u>SYNONYM:</u></p> <p>Steepness of a line</p>	<table><tr><th>Formula</th><th>When To Use</th></tr><tr><td>$m = \frac{y_2 - y_1}{x_2 - x_1}$</td><td>When given two points</td></tr><tr><td>$m = \frac{\text{rise}}{\text{run}}$</td><td>When a line is graphed</td></tr><tr><td>$m = \frac{\Delta y}{\Delta x}$</td><td>When a line is graphed</td></tr></table>	Formula	When To Use	$m = \frac{y_2 - y_1}{x_2 - x_1}$	When given two points	$m = \frac{\text{rise}}{\text{run}}$	When a line is graphed	$m = \frac{\Delta y}{\Delta x}$	When a line is graphed
Formula	When To Use								
$m = \frac{y_2 - y_1}{x_2 - x_1}$	When given two points								
$m = \frac{\text{rise}}{\text{run}}$	When a line is graphed								
$m = \frac{\Delta y}{\Delta x}$	When a line is graphed								
Direction	Zero vs. Undefined								
 <p>Positive – as x increases y increases</p> <p>Negative – as x increases y decreases</p>	 <p>Undefined $\frac{\#}{0}$ “if the zero is under the line the slope is undefined”</p> <p>Zero – as x increases y stays the same $\frac{0}{\#}$</p>								

Find the slope of the line that passes through the given points. (Be sure to write down the formula you are using)

Ex: (5, 2) and (4, -1)

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

$$m = \frac{-1 - 2}{4 - 5}$$

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

$$m = 3$$

Ex: (-2, 3) and (4, 6)

$$m = \frac{6 - 3}{4 - (-2)}$$

$$m = \frac{3}{6}$$

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

Ex: $\left(\frac{9}{2}, 5\right)$ and $\left(\frac{1}{2}, -3\right)$

$$m = \frac{-3 - 5}{\frac{1}{2} - \frac{9}{2}}$$

$$m = \frac{-8}{\frac{-8}{2}}$$

$$m = \frac{-8}{-4}$$

$$m = 2$$

Ex: (3, 4) and (-2, 4)

$$m = \frac{4 - 4}{-2 - 3}$$

$$m = \frac{0}{-5}$$

$$m = 0$$

Ex: (-5, 1) and (-5, 3)

$$m = \frac{3 - 1}{-5 - (-5)}$$

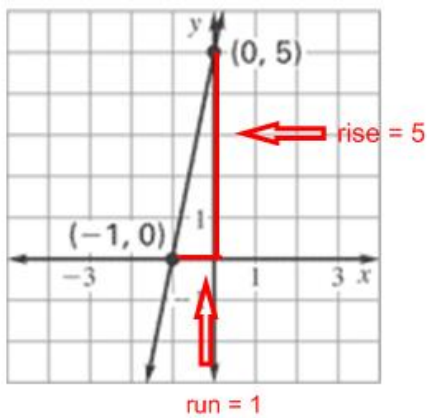
$$m = \frac{2}{0}$$

$$m = \text{undefined}$$

Find the slope of the line graphed.

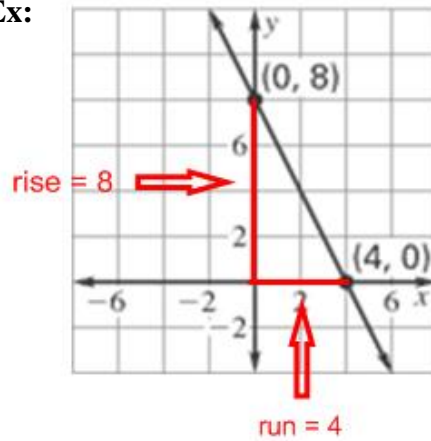
For each graph, use the formula $\frac{\text{rise}}{\text{run}}$

Ex:



$$m = 5$$

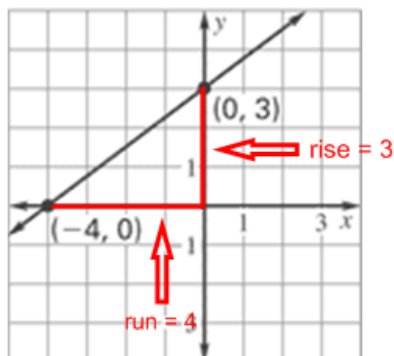
Ex:



$$m = -2$$

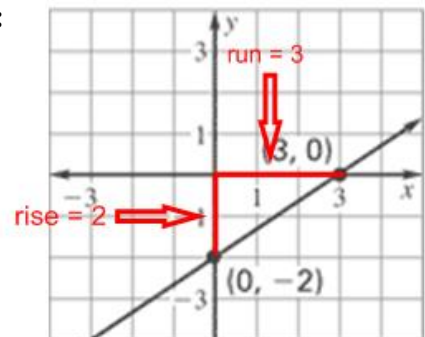
*don't forget the slope is negative if the line goes down from left to right

Ex:



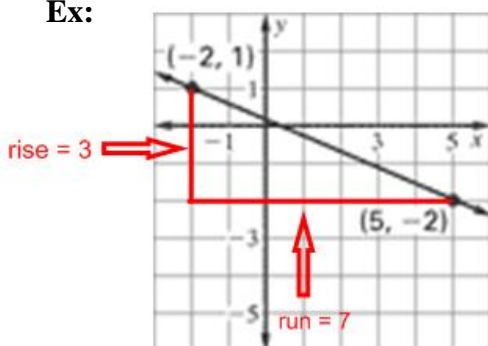
$$m = \frac{3}{4}$$

Ex:



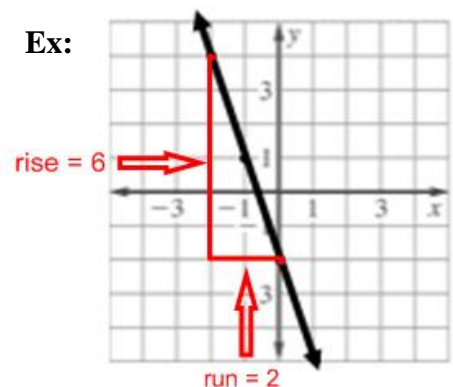
$$m = \frac{2}{3}$$

Ex:



$$m = -\frac{3}{7}$$

Ex:



$$m = -3$$

*create points if necessary

Rate of Change: compares change in one quantity to change in another. (Slope for the real world) *Units are important! Typically expressed as a unit rate

Ex: Gas prices went from \$3 to \$4 between June 1st of 2008 and August 1st of that same year. Find the rate of change for the price of gas during that time period?

First, figure out what is x and what is y , based on independent (x) and dependent (y) variables. Price depends on the days, so price, dollars, is x and days is y .

Start by finding slope using the formula: $m = \frac{\Delta y}{\Delta x}$

$$m = \frac{\$1}{62 \text{ days}} \quad \text{So the price increased by \$1 in 62 days}$$

$$m = \frac{\$0.016}{1 \text{ day}} \quad \text{Now find out how much the price changed in 1 day by converting to a unit rate.}$$

Ex: Gas prices then began to fall after this spike. They fell back to \$2 by November 19th. What is the rate of change of the price of gas for this time period?

Again, find the change in price compared to the change in number of days.

$$m = \frac{-\$2}{111 \text{ days}}$$

$$m = \frac{-\$0.018}{1 \text{ day}}$$

Ex: Which time period had a greater rate of change? Why?

When the price fell back to \$2, the rate of change was greater. Even though it is negative, it fell at a faster rate.

Ex: The table below shows the cost of using a computer at the internet café for a given amount of time. Find the rate of change with respect to time.

Time (hrs)	2	4	6
Cost (\$)	7	14	21

x : hours, y : dollars

$$m = \frac{\$7}{2 \text{ hours}} \quad \text{Rate of change: \$3.50/hour}$$