Lines

This section will cover the following topics

Slope and the Slope Formula

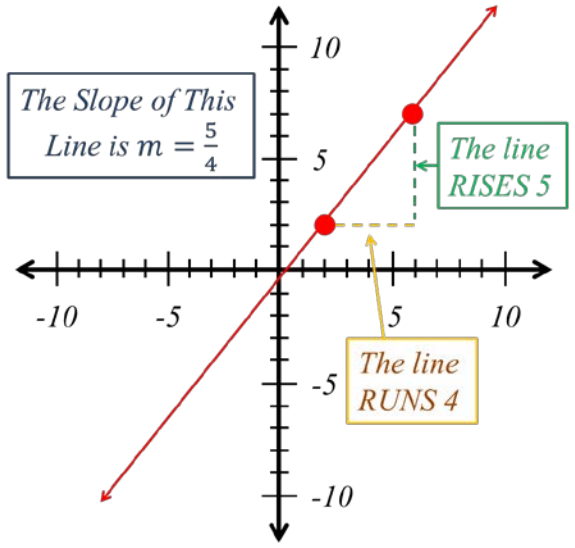
Equation of a Line in Slope-Intercept Form

Graphing Lines

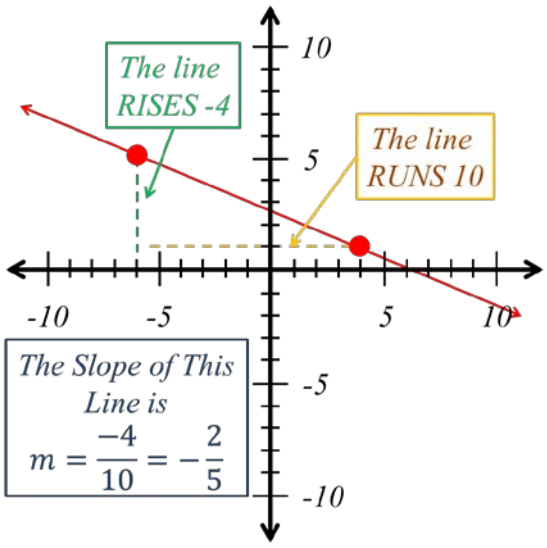
Slope and the Slope Formula

Every line travels in a specific direction. That direction is referred to as the slope of a line, which is often expressed as $m = \frac{RISE}{RUN}$; that is, a measure of how quickly a line rises (or falls) relative to quickly it runs (or travels to the right). The examples below illustrate this.

Example 1



Example 2



An analytical way of determining the slope of a line is through the slope formula, which is $m = \frac{y_2 - y_1}{x_2 - x_2}$. Here is an example of how the slope formula is used.

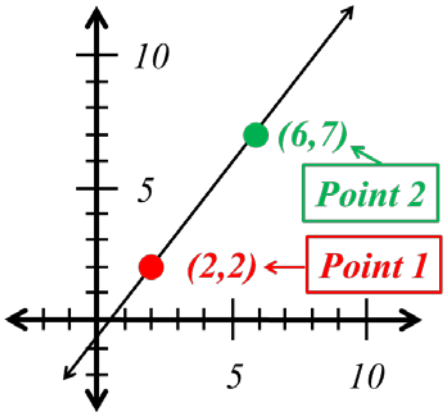
Using the graph on the right, will let

$(x_1, y_1) = (2, 2)$, and

$(x_2, y_2) = (6, 7)$.

From here we do a substitution into the slope formula to get,

$$m = \frac{y_2 - y_1}{x_2 - x_2} = \frac{7 - 2}{6 - 2} = \frac{5}{4}$$



Equation of a Line in Slope-Intercept Form

The slope-intercept form of the equation of a line is $y = mx + b$, where m represents the slope and b represents the *y-intercept*. More precisely, the *y-intercept* is the point $(0, b)$. Note that the *y-intercept* occurs when $x = 0$, thus the *y-intercept* is $(0, b)$ no matter what the value of b. Let's look at some examples of identifying the slope and intercept from such equations.

Equation	Slope	y – intercept	Notes
$y = 5x - 2$	$m = 5$	$(0, -2)$	It may be helpful to write $m = \frac{5}{1}$; that is, $RISE = 5$ and $RUN = 1$
$y = -\frac{3}{5}x + \frac{1}{2}$	$m = -\frac{3}{5}$	$\left(0, \frac{1}{2}\right)$	Be sure to include the negative sign with the slope

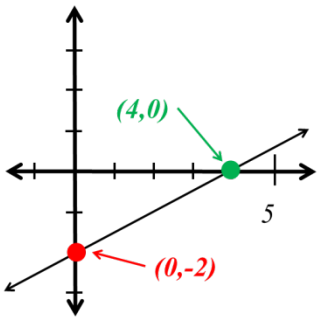
A Quick Tip

With *x-intercepts* and *y-intercepts*, we already know half of the ordered pair; Remember a line crosses the *y-axis* (the *y-intercept*) when $x = 0$ and a line crosses the *x-axis* (the *x-intercept*) when $y = 0$

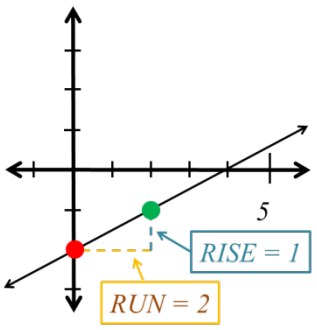
Graphing Lines

Graphing lines starts with a very simple concept. Draw two points and then connect them with a straight line. The only question is how you get the two points. We will take a look at two methods to graph the line $y = \frac{1}{2}x - 2$

Method 1: Determine the *x* and *y-intercepts*

y-intercept	***x-intercept***	
This one is easy because the equation $y = \frac{1}{2}x - 2$ tells us that the *y-intercept* is the point $(\mathbf{0}, \mathbf{-2})$	We let $y = 0$ $0 = \frac{1}{2}x - 2$ Solving for x gives $x = 4$ The x-intercept is $(\mathbf{4}, \mathbf{0})$	

Method 2: Graph the y-intercept and then use the slope to create a second point.

y-intercept	***slope***	
Again this is easy because the equation $y = \frac{1}{2}x - 2$ tells us that the *y-intercept* is the point $(\mathbf{0}, \mathbf{-2})$	Here we will interpret the slope $m = \frac{1}{2}$ as $\frac{RISE}{RUN}$. From $(\mathbf{0}, \mathbf{-2})$, we will *RISE 1* and *RUN 2*	

Practice Problems

Use the slope formula to find the slope of the line that connects the following points

1. $(-2,7)$ and $(4,1)$

2. $(-1,-3)$ and $(3,6)$

Identify the slope and y-intercept given the following equations

3. $y = -3x + 4$

4. $y = \frac{2}{3}x - \frac{5}{7}$

Graph the following lines

5. $y = -2x + 5$

6. $y = \frac{3}{4}x - 2$

Answers

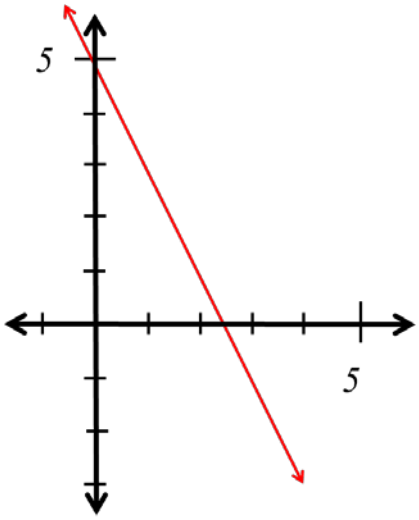
1. $m = -1$

2. $m = \frac{9}{4}$

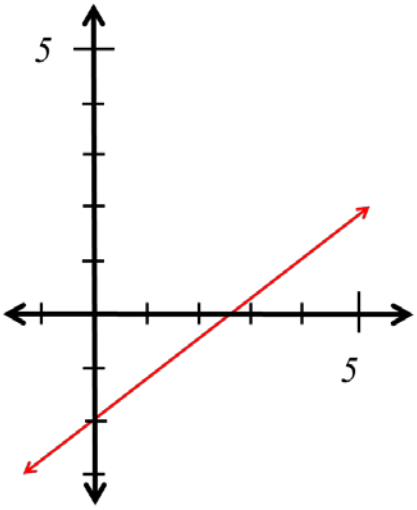
3. $m = -3, (0,4)$

4. $m = \frac{2}{3}, (0, -\frac{5}{7})$

5.



6.



Additional Help

Search YouTube.com for "slope of a line", "slope formula", or "graphing a line"