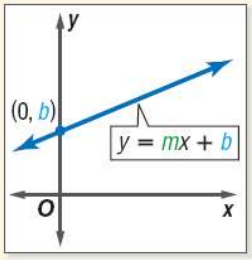
Graphing Linear Equations in Slope-Intercept Form

KEY CONCEPT — **Slope-Intercept Form**

Words The linear equation $y = mx + b$ is written in slope-intercept form, where m is the slope and b is the y-intercept.

Symbols $y = mx + b$ (slope: m; y-intercept: b)

Graph



To graph equations in slope-intercept form, we will follow a 5-step process:

Step 1: Plot the y-intercept on the y-axis of the graph.

Step 2: Turn the slope into a fraction if it isn't already.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x}$ from the y-intercept. This means the top number in the fraction tells you amount of vertical change (up or down), and the bottom number in the fraction tells you amount of horizontal change (right or left).

Step 4: Connect our points with a line.

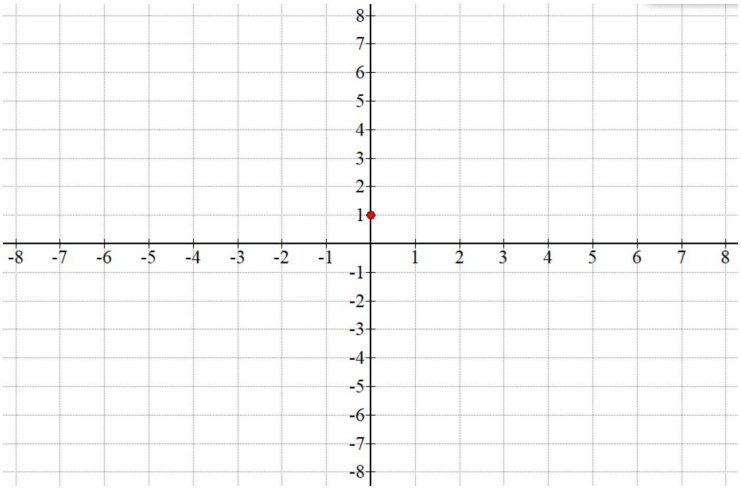
Step 5: Check that our slope is correct based on whether the line should be rising or falling.

Example 1: Graph an Equation in Slope-Intercept Form

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

**If you remember from our last lesson, the slope of the line is $-\frac{2}{3}$ and the y-intercept is 1.

Step 1: Plot the y-intercept (in this case 1) on the y-axis.



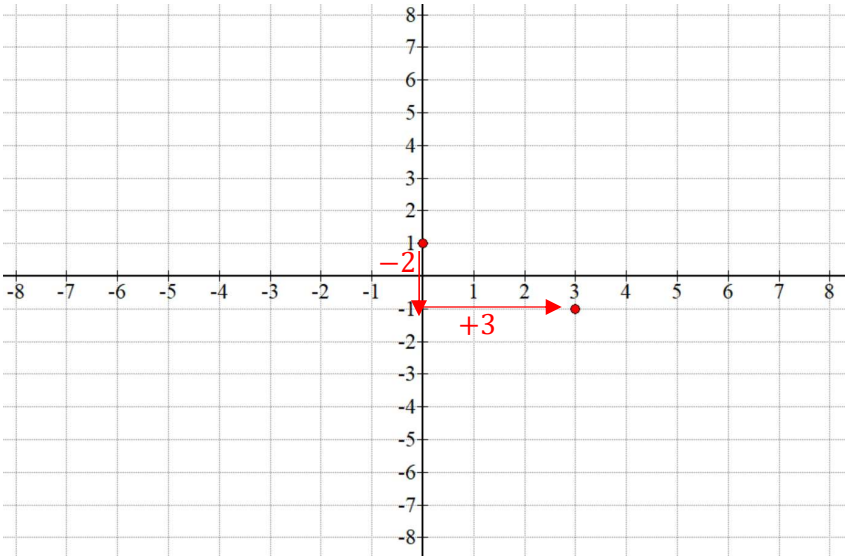
Step 2: Our slope is already in fraction form so we can skip this step.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{chang\ \ in\ x}$ from the y-intercept.

Our slope is $-\frac{2}{3}$. Because there is a negative, we have to choose whether the negative goes with the numerator (top number) of the fraction or the denominator (bottom number) of the fraction. It does not matter which one we choose. For our purposes, I will do both and plot both points.

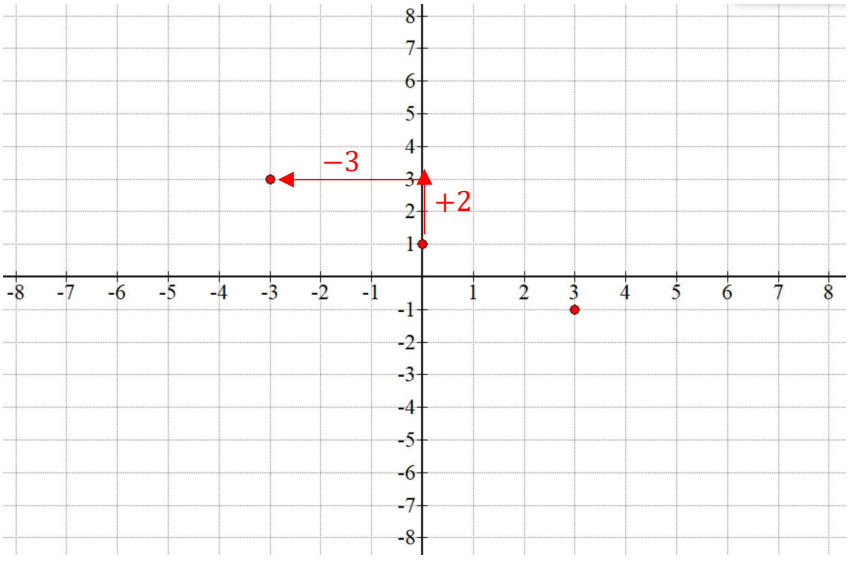
Option 1: We choose the negative to go with the numerator

$\frac{-2}{3}$ means that we will go down 2 units from the y-intercept (down because the two is a negative), and to the right 3 units (right because the three is positive).

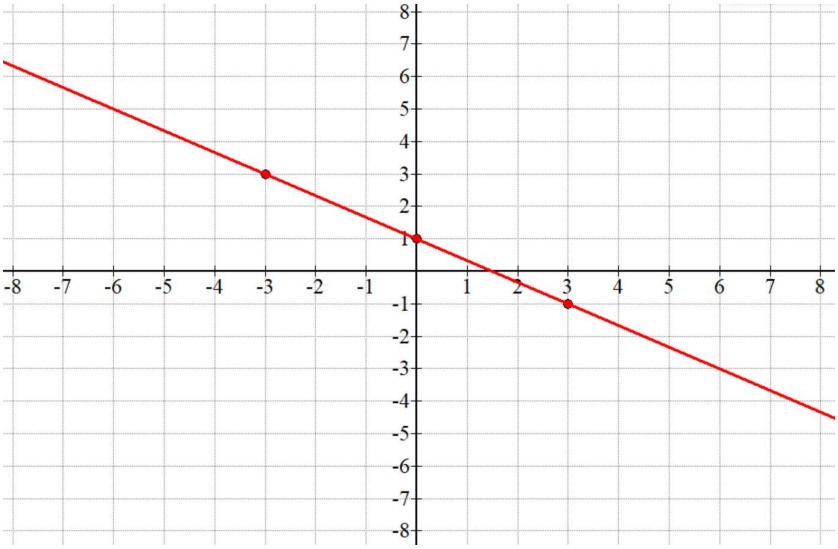


Option 2: We choose the negative to go with the denominator

$\frac{2}{-3}$ means that we will go up 2 units from the y-intercept (up because the two is a positive), and to the left 3 units (left because the three is negative).



Step 4: Connect our points with a line.



Step 5: Check that our slope is correct based on whether the line should be rising or falling.

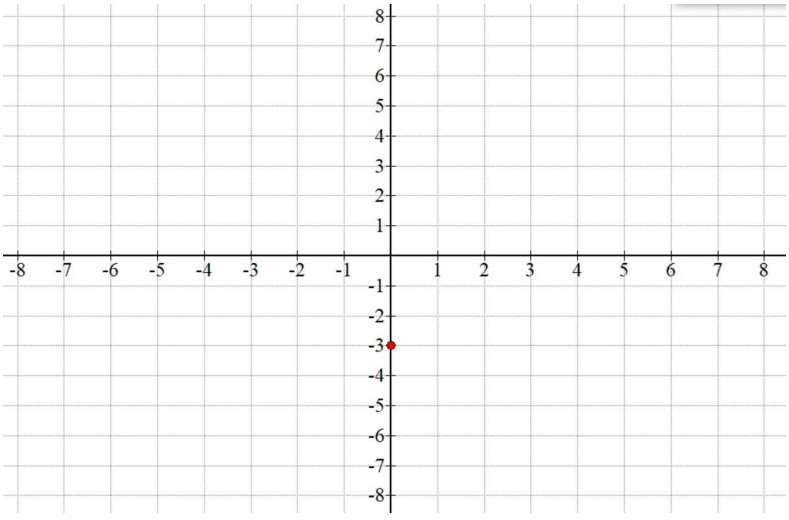
Our slope was a negative number, so we expect to see that our line is falling as we read from left to right. Since our line is falling, we know that we have graphed the line with the appropriate sign on the slope.

Example 2: Graph an Equation in Slope-Intercept Form

$y = 2x - 3$

**If you remember from our last lesson, the slope of the line is 2 and the y-intercept is -3.

Step 1: Plot the y-intercept (in this case -3) on the y-axis.



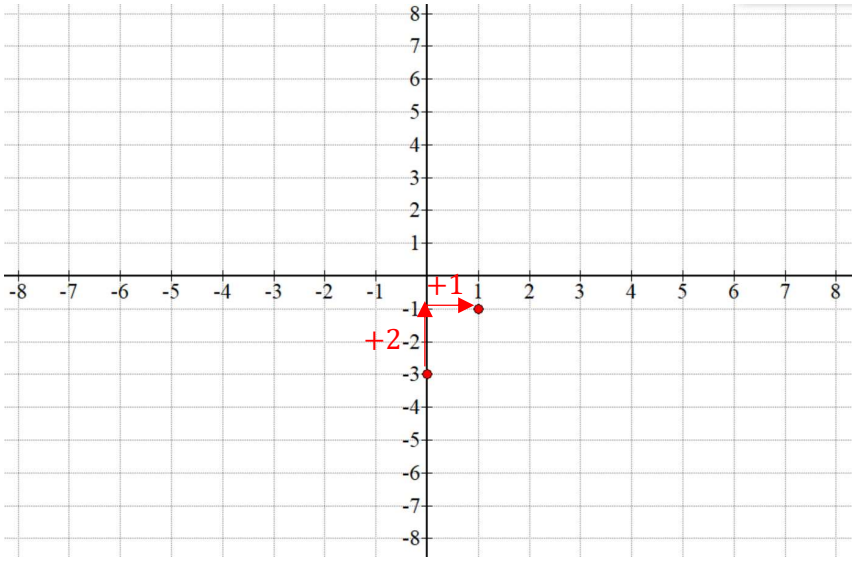
Step 2: In order to put our slope in fraction form, we just need to put the whole number over one. The slope in fraction form is $\frac{2}{1}$.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{cha \quad in\ x}$ from the y-intercept.

Our slope is $\frac{2}{1}$. Because these are both positive, we can choose both numerator and denominator to be positive, or we can choose both values to be negative. Remember that a negative divided by a negative is a positive. For our purposes, I will do both and plot both points.

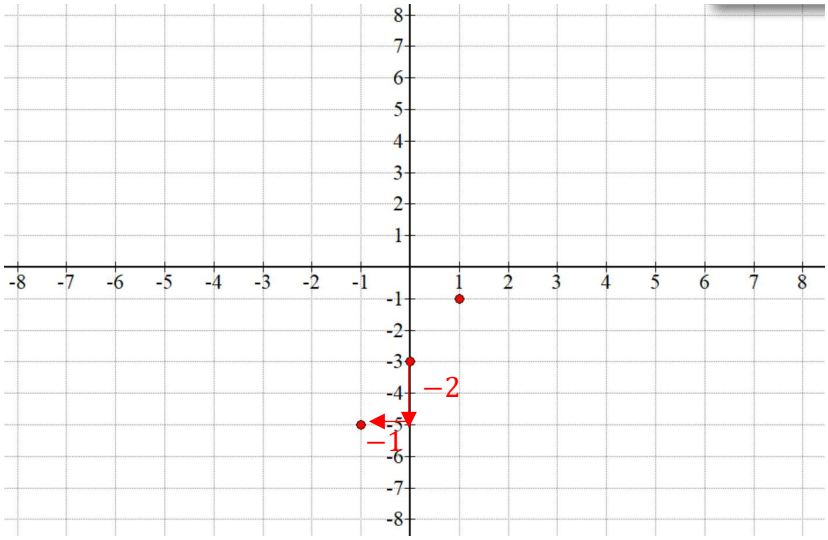
Option 1: We choose both values positive

$\frac{2}{1}$ means that we will go up 2 units from the y-intercept (up because the two is a positive), and to the right 1 unit (right because the one is positive).

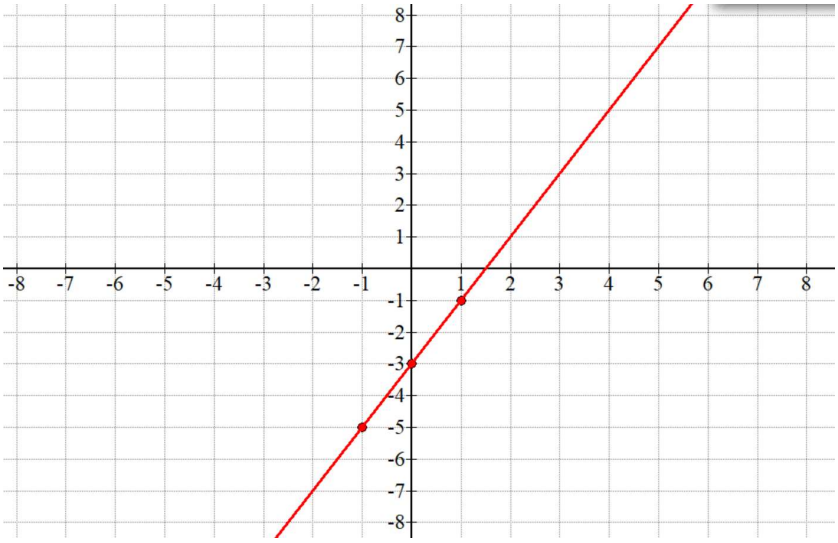


Option 2: We both values to be negative

$\frac{-2}{-1}$ means that we will go down 2 units from the y-intercept (down because the two is a negative), and to the left 1 unit (left because the one is negative).



Step 4: Connect our points with a line.



Step 5: Check that our slope is correct based on whether the line should be rising or falling.

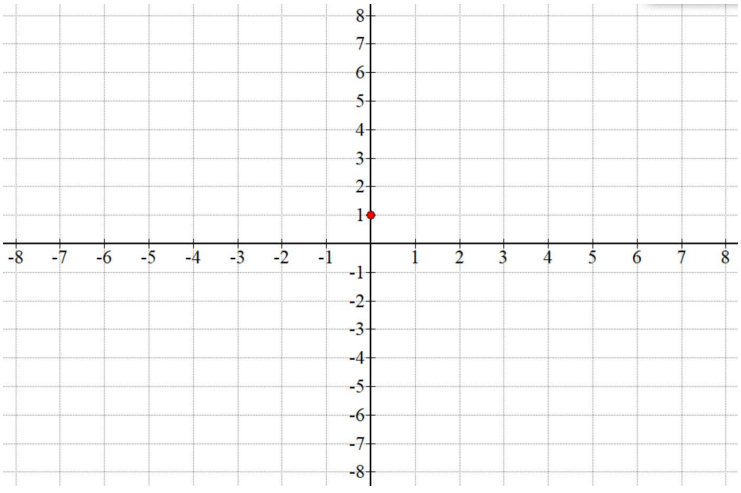
Our slope was a positive number, so we expect to see that our line is rising as we read from left to right. Since our line is rising, we know that we have graphed the line with the appropriate sign on the slope.

Example 3: Graph an Equation in Slope-Intercept Form

$y = -3x + 1$

**If you remember from our last lesson, the slope of the line is -3 and the y-intercept is 1.

Step 1: Plot the y-intercept (in this case 1) on the y-axis.



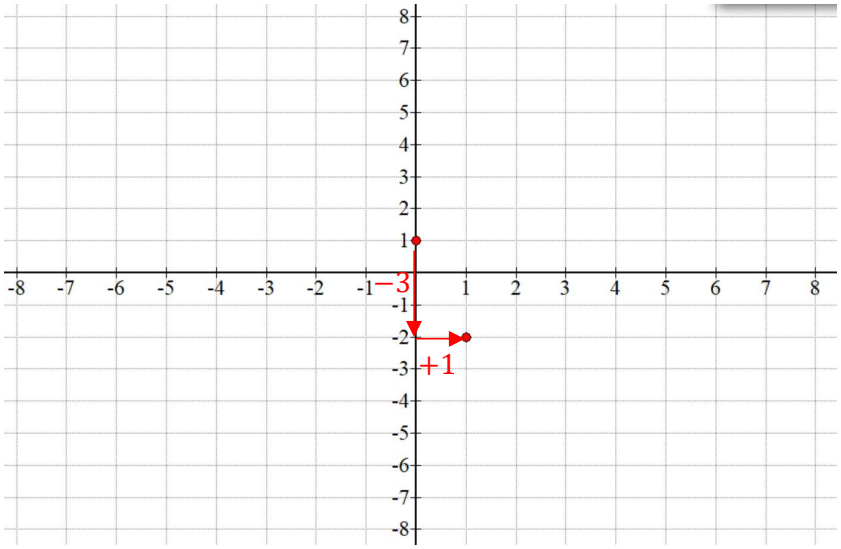
Step 2: In order to put our slope in fraction form, we just need to put the whole number over one. The slope in fraction form is $-\frac{3}{1}$.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x}$ from the y-intercept.

Our slope is $-\frac{3}{1}$. Because there is a negative, we have to choose whether the negative goes with the numerator of the fraction or the denominator of the fraction. It does not matter which one we choose. For our purposes, I will do both and plot both points.

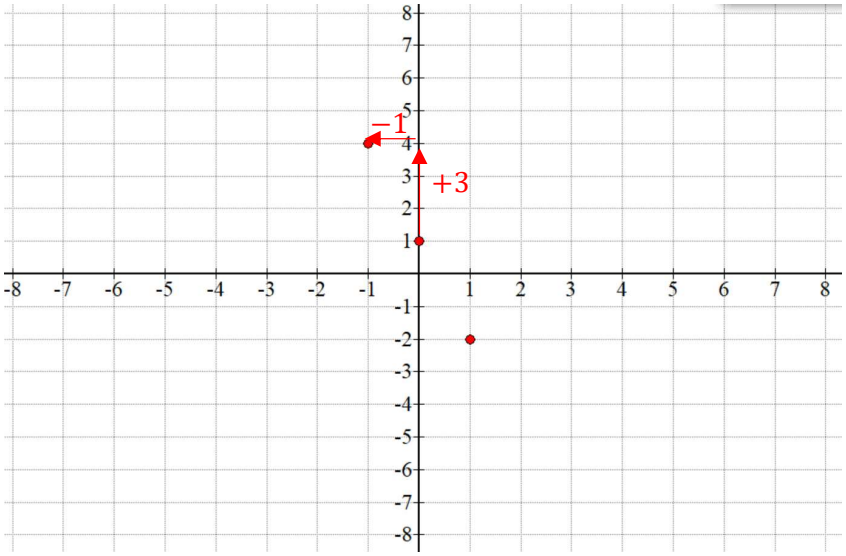
Option 1: We choose the negative to go with the numerator

$\frac{-3}{1}$ means that we will go down 3 units from the y-intercept (down because the three is a negative), and to the right 1 unit (right because the one is positive).

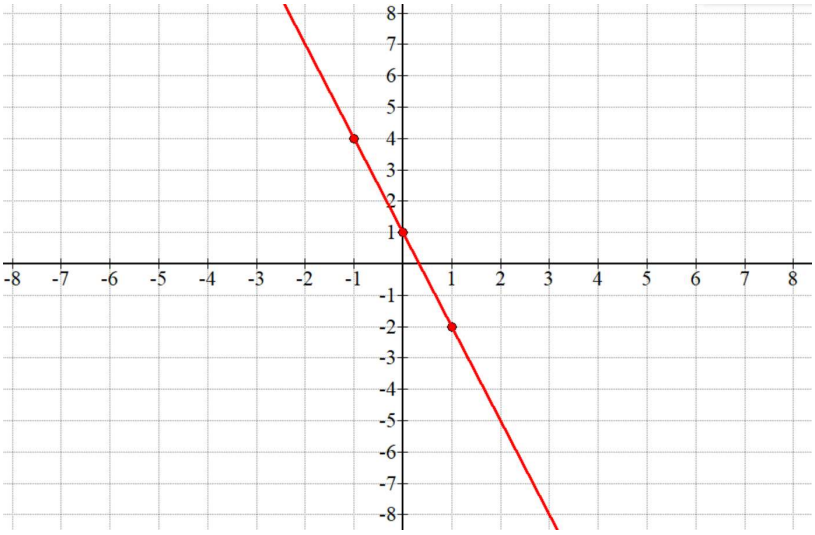


Option 2: We choose the negative to go with the denominator

$\frac{3}{-1}$ means that we will go up 3 units from the y-intercept (up because the three is a positive), and to the left 1 unit (left because the one is negative).



Step 4: Connect our points with a line.



Step 5: Check that our slope is correct based on whether the line should be rising or falling.

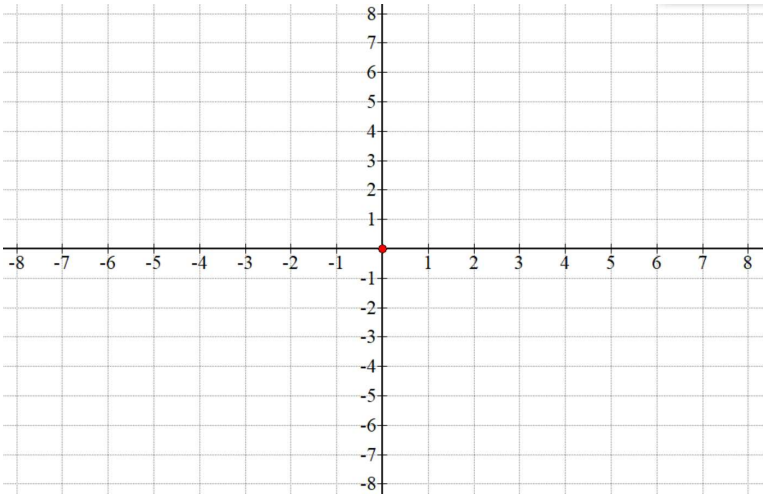
Our slope was a negative number, so we expect to see that our line is falling as we read from left to right. Since our line is falling, we know that we have graphed the line with the appropriate sign on the slope.

Example 4: Graph an Equation in Slope-Intercept Form

$$y = \frac{5}{3}x$$

**If you remember from our last lesson, the slope of the line is $\frac{5}{3}$. In this case, because there is no number added to the end of the $\frac{5}{3}x$ that means that the y-intercept is 0.

Step 1: Plot the y-intercept (in this case 0) on the y-axis.



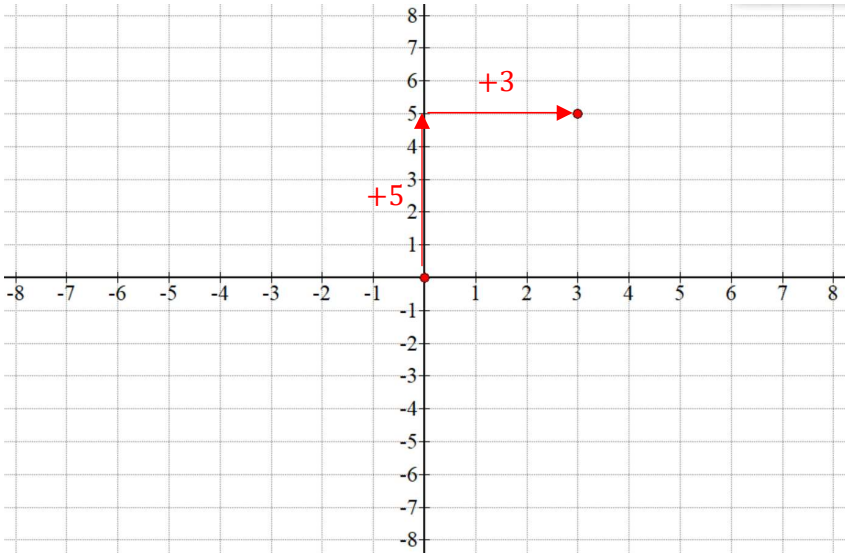
Step 2: Our slope is already in fraction form so we can skip this step.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x}$ from the y-intercept.

Our slope is $\frac{5}{3}$. Because these are both positive, we can choose both numerator and denominator to be positive, or we can choose both values to be negative. Remember that a negative divided by a negative is a positive. For our purposes, I will do both and plot both points.

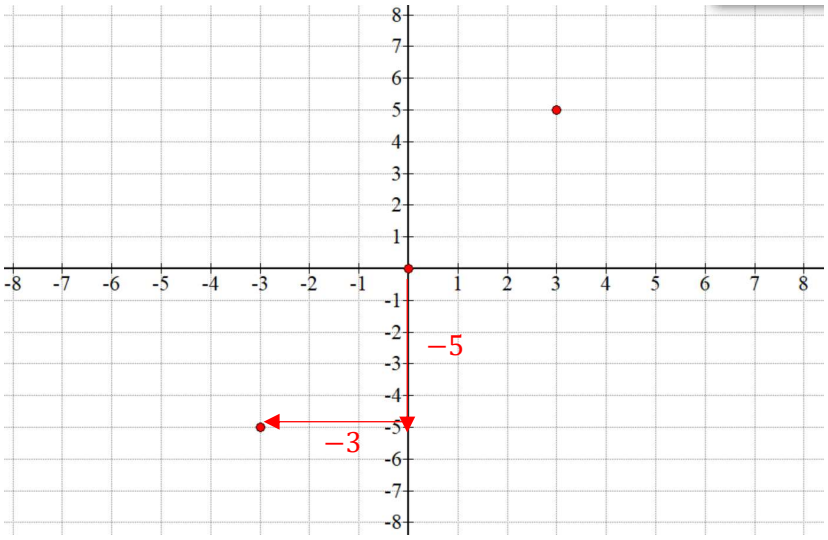
Option 1: We choose both values positive

$\frac{5}{3}$ means that we will go up 5 units from the y-intercept, and to the right 3 units.

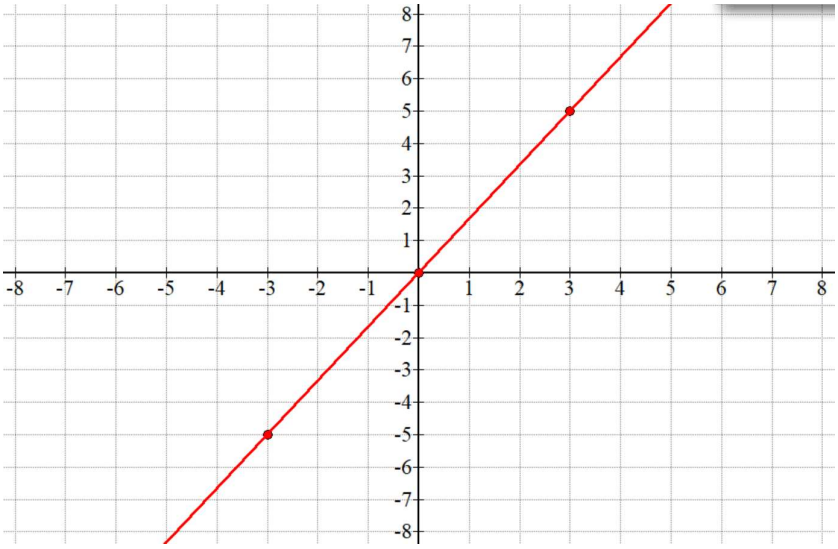


Option 2: We both values to be negative

$\frac{-5}{-3}$ means that we will go down 5 units from the y-intercept, and to the left 3 units.



Step 4: Connect our points with a line.



Step 5: Check that our slope is correct based on whether the line should be rising or falling.

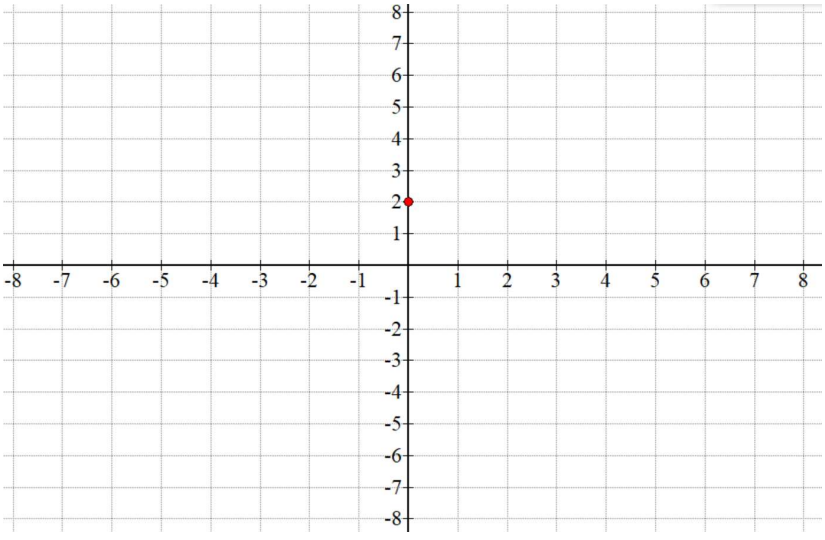
Our slope was a positive number, so we expect to see that our line is rising as we read from left to right. Since our line is rising, we know that we have graphed the line with the appropriate sign on the slope.

Example 5: Graph an Equation in Slope-Intercept Form

$y = -x + 2$

**The slope of the line is -1 (remember that if there is no number in front of the variable, we know it is assumed to be a 1) and the y-intercept is 2.

Step 1: Plot the y-intercept (in this case 2) on the y-axis.



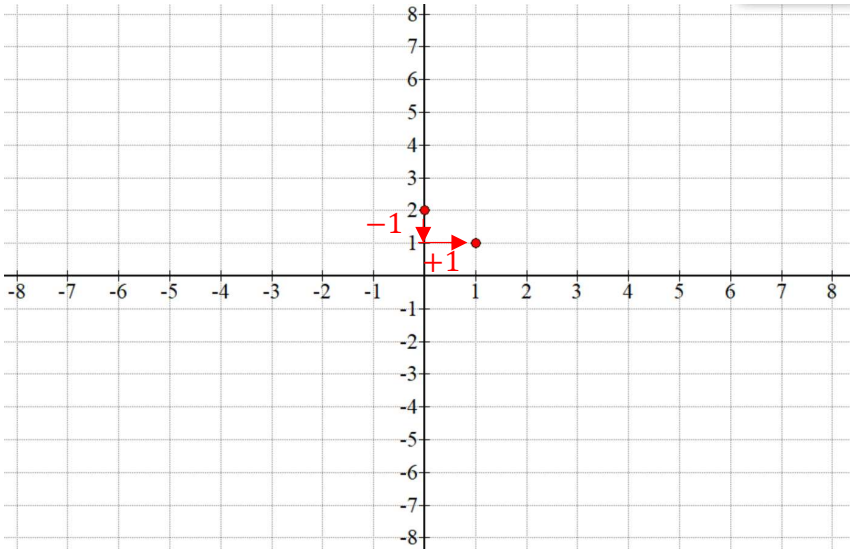
Step 2: In order to put our slope in fraction form, we just need to put the whole number over one. The slope in fraction form is $-\frac{1}{1}$.

Step 3: Plot additional points using the slope as a $\frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x}$ from the y-intercept.

Our slope is $-\frac{1}{1}$. Because there is a negative, we have to choose whether the negative goes with the numerator of the fraction or the denominator of the fraction. It does not matter which one we choose. For our purposes, I will do both and plot both points.

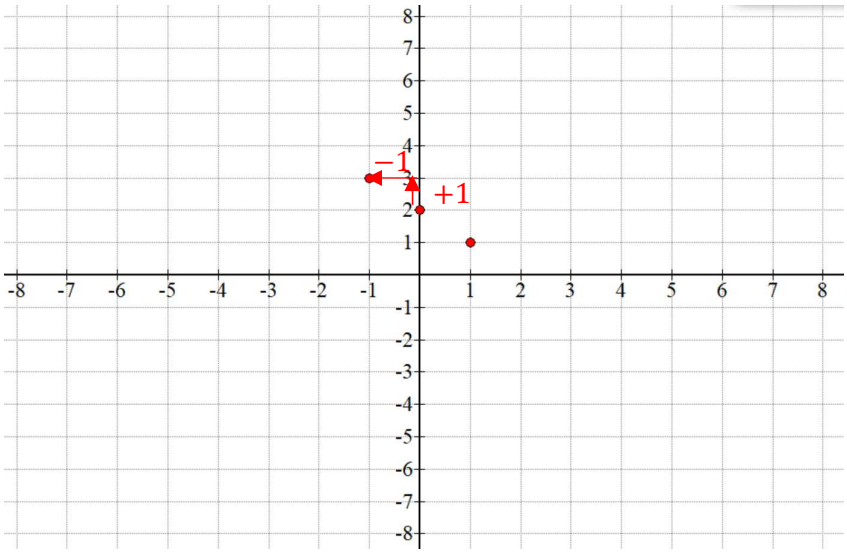
Option 1: We choose the negative to go with the numerator

$\frac{-1}{1}$ means that we will go down 1 unit from the y-intercept (down because the one is a negative), and to the right 1 unit (right because the one is positive).

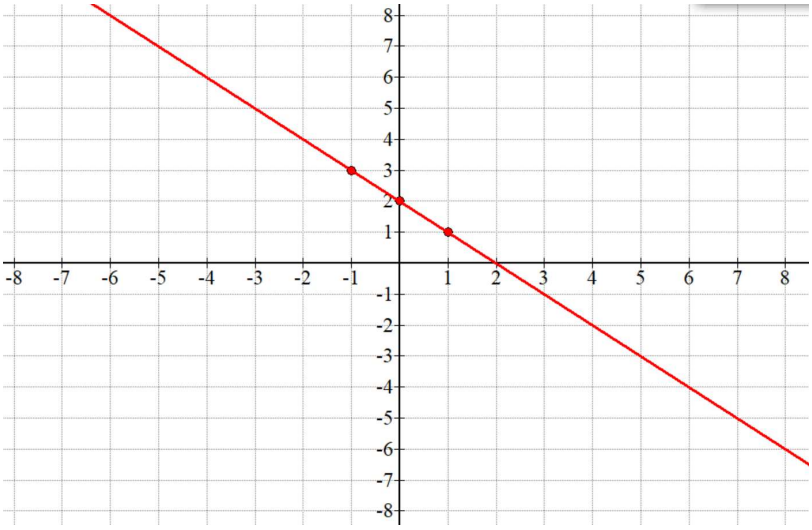


Option 2: We choose the negative to go with the denominator

$\frac{1}{-1}$ means that we will go up 1 unit from the y-intercept (up because the one is a positive), and to the left 1 unit (left because the one is negative).



Step 4: Connect our points with a line.



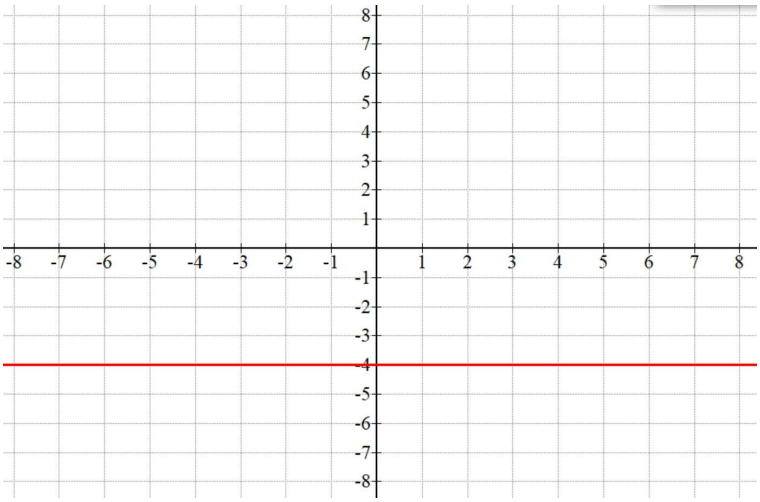
Step 5: Check that our slope is correct based on whether the line should be rising or falling.

Our slope was a negative number, so we expect to see that our line is falling as we read from left to right. Since our line is falling, we know that we have graphed the line with the appropriate sign on the slope.

Example 6: Special Case – Horizontal Line

$y = -4$

Because there is only a y variable and there is no x, we know that this is a horizontal line. So, we draw a horizontal line through -4 on the y-axis (on the y-axis because it is $y = \#$)



Example 7: Special Case – Vertical Line

$x = -2$

Because there is only an x variable and there is no y, we know that this is a vertical line. So, we draw a vertical line through -2 on the x-axis (on the x-axis because it is $x = \#$)