

# Slope

The slope of a line is how steep the graph of the line is, or the rate of change of the  $y$ -coordinates of the points of the graph as you go from left to right. In the equation of a line, slope is denoted by  $m$ . It's not known why  $m$  is used, but you can think “ $m$  is for move” to help you remember it's how fast the graph “moves” (changes).

The formula for the slope of a line is

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

where rise means vertical movement (up and down) and run means horizontal movement (left and right). When looking at a graph, count how far up (positive) or down (negative) the graph moves from one point to another (the “rise”), and then divide that by how far to the right the graph moves (the “run”). In other words, we make a fraction by putting the rise in the numerator and the run in the denominator. So another way to remember what slope means is “rise over run,” because in a fraction we put the numerator “over” (above) the denominator. We can also write the slope formula as

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

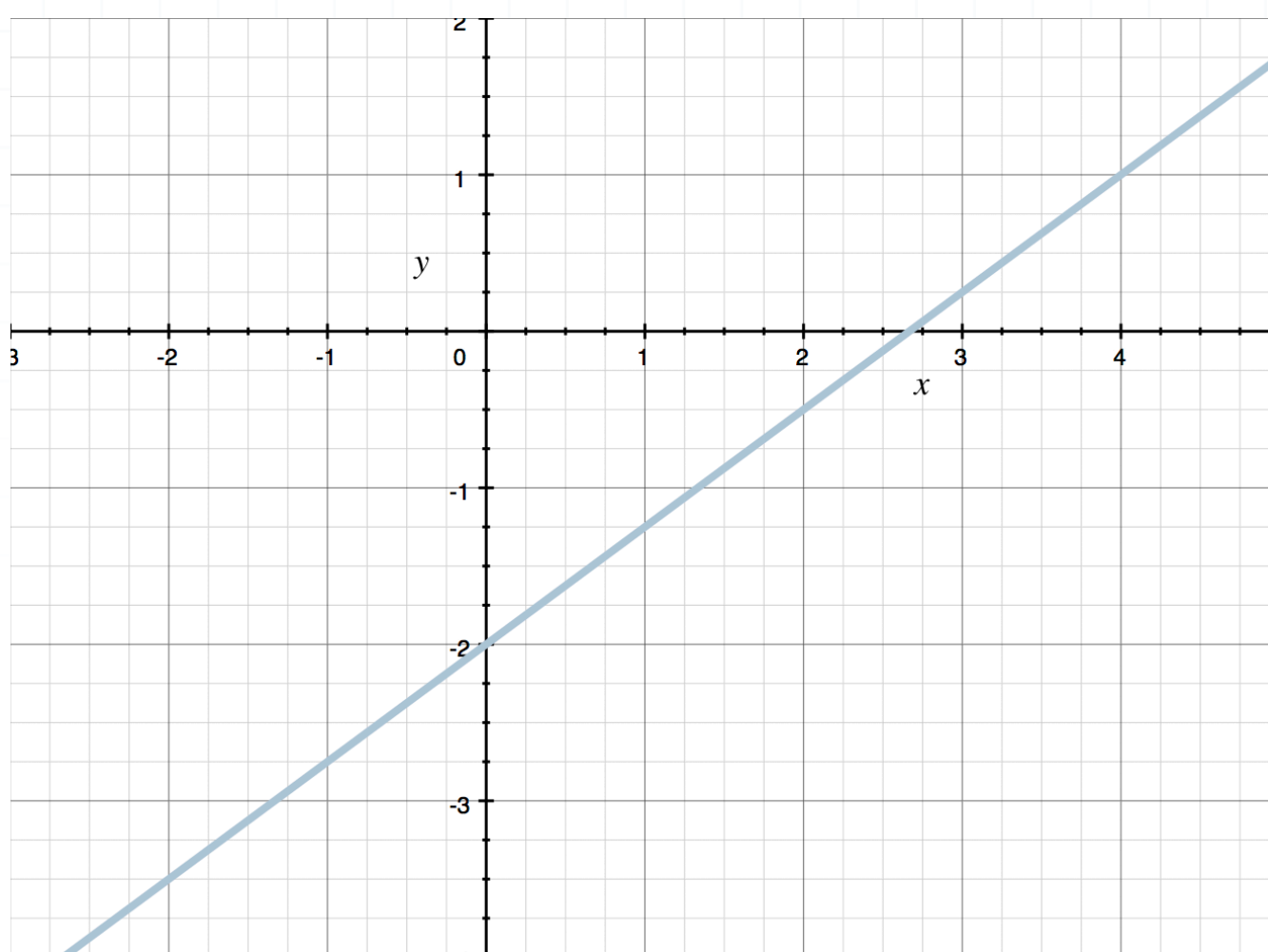
where  $(x_1, y_1)$  is one point on the line and  $(x_2, y_2)$  is another point on the line. This is the algebraic way of finding the slope, which you can use when you can't look at the graph, or when it's difficult to figure out rise/run by looking at the graph.



It never matters which point you call  $(x_1, y_1)$  and which one you call  $(x_2, y_2)$ . The slope will be the same either way. Also, it doesn't matter which pair of points (on the line) you use to find the slope. The slope will always be the same.

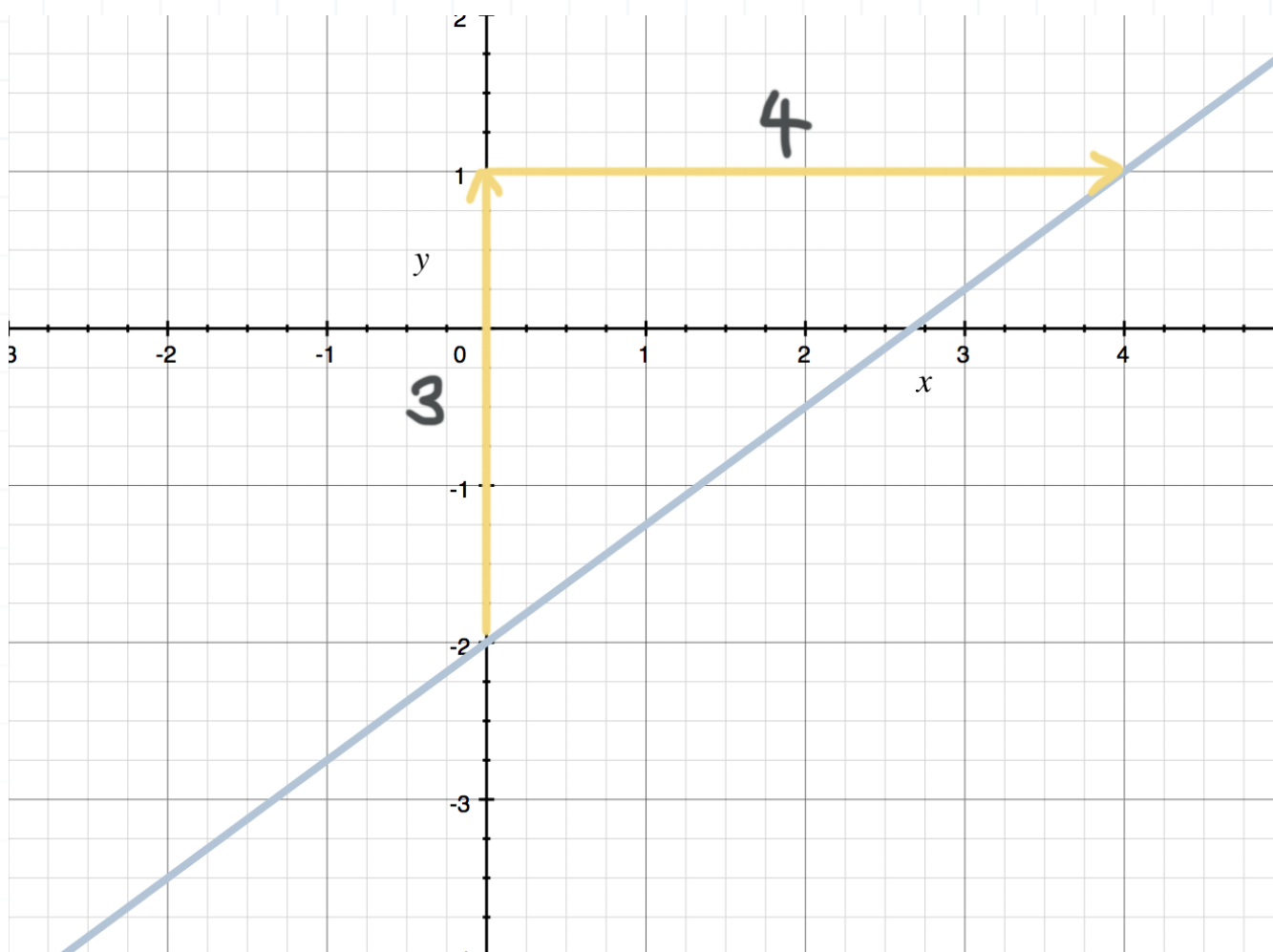
### Example

What is the slope of the line?



Find two points on the graph and count the rise (up and down) and run (to the right).





The rise is 3 and the run is 4, so the slope is  $\frac{3}{4}$ .

Let's try another example.

### Example

What is the slope of the line that goes through the points  $(-1, 5)$  and  $(3, -3)$ ?

To find the slope, use the formula

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



It's best to label the points before you plug them in. We'll say

$$(-1, 5) = (x_1, y_1)$$

$$(3, -3) = (x_2, y_2)$$

It never matters which point you call  $(x_1, y_1)$  and which one you call  $(x_2, y_2)$ .

The slope will be the same either way. Plug the points into the slope formula.

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

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

$$m = -2$$

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