

If we have a point, (x_1, y_1) , and a slope, m , here's the formula we use to find the equation of a line:

$$y - y_1 = m(x - x_1)$$

It's called the point-slope formula
(Duh!)

You are going to use this a LOT!

Luckily, it's pretty easy -- let's just do one:

Let's find the equation of the line that passes through the point $(4, -3)$ with a slope of -2 :

$$y - y_1 = m(x - x_1)$$

$$m = -2$$

$$(4, -3)$$

x_1 y_1

Just stick the stuff in a clean it up!

$$y - (-3) = -2(x - 4)$$

$$y + 3 = -2x + 8$$

$$\begin{array}{r} y + 3 = -2x + 8 \\ -3 \qquad \qquad -3 \\ \hline y = -2x + 5 \end{array}$$

← be careful here!
done

Let's find the equation of the line that passes through the point $(-5, 2)$ with a slope of $-\frac{3}{4}$.

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -\frac{3}{4}(x - (-5))$$

To clean this up, we'll multiply both sides by 4:

$$4(y - 2) = 4\left(-\frac{3}{4}\right)(x + 5)$$

Be very careful here!
You only multiply the 4 into the guy in front!

$$4y - 8 = -3(x + 5)$$

$$4y - 8 = -3x - 15$$

$$\begin{array}{r} 4y - 8 = -3x - 15 \\ +8 \qquad \qquad +8 \\ \hline 4y = -3x - 7 \end{array}$$

$$\begin{array}{r} 4y = -3x - 7 \\ +3x \quad +3x \\ \hline 3x + 4y = -7 \end{array}$$

OR

$$\begin{array}{r} 4y = -3x - 7 \\ \hline \frac{4y}{4} = \frac{-3x - 7}{4} \\ y = -\frac{3}{4}x - \frac{7}{4} \end{array}$$

$$y - y_1 = m(x - x_1)$$

Anytime we need to get the equation of a line, we need two things

1 a point

2 a slope

ALWAYS!

So, what do we do if we are just given two points and no slope?

No problem -- we'll just use the two points to pop the slope using this guy:

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

Check it out:

Let's find the equation of the line that passes through the points

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

This one's a two-stepper...

STEP 1: Find the slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{-2 - 1} = \frac{2}{-3} = -\frac{2}{3}$$

STEP 2: Now, use the point-slope formula with one of our points,

(1, 3), and $m = -\frac{2}{3}$.

* I picked (1, 3) since it didn't have any negatives -- it's just easier.

$$y - y_1 = m(x - x_1)$$

$$y - 3 = -\frac{2}{3}(x - 1) \quad \text{multiply by 3}$$

$$3(y - 3) = 3\left(-\frac{2}{3}\right)(x - 1)$$

$$3y - 9 = -2(x - 1)$$

$$3y - 9 = -2x + 2$$

$$\begin{array}{r} +9 \qquad \qquad +9 \\ \hline 3y = -2x + 11 \end{array}$$

$$3y = -2x + 11$$

$$2x + 3y = 11 \quad \text{or} \quad y = -\frac{2}{3}x + \frac{11}{3}$$