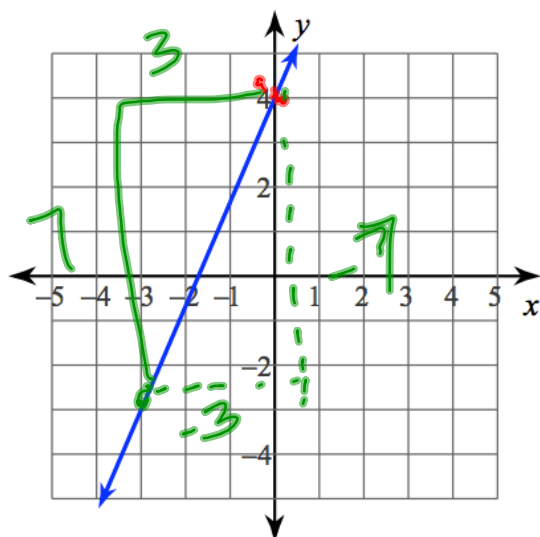


Writing Equations of Lines

How can we write the equation of a line when we have the slope and a point or two points?

Quick Review:

Let's start with a graph:



What are the two things you need to write the equation of a line?

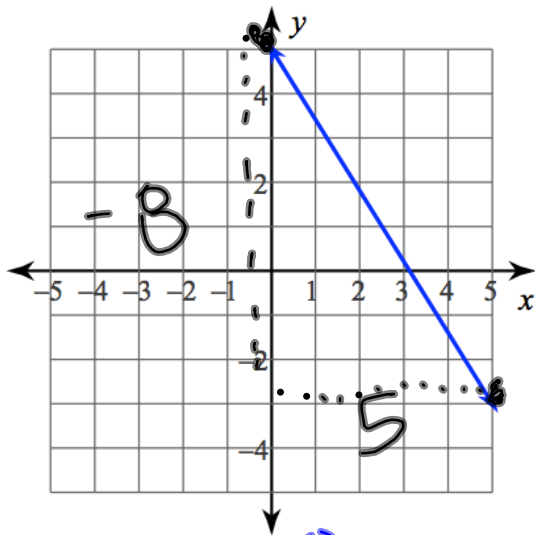
$$y = mx + b$$

Can you see either of these on the graph easily?

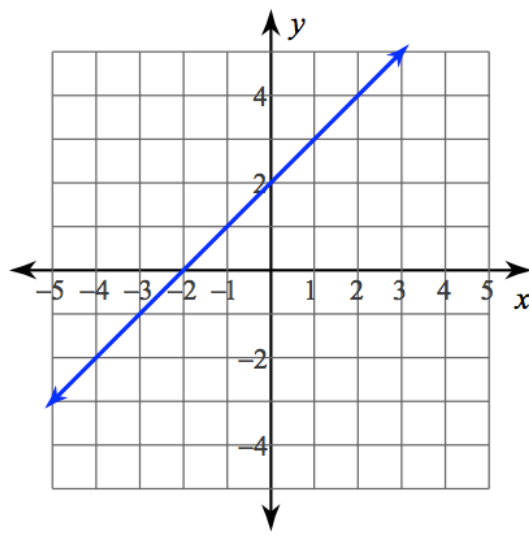
What is the equation of this line?

$$y = \frac{7}{3}x + 4$$

Try these two:



$$y = -\frac{8}{5}x + 5$$



$$y = x + 2$$

What if you are given the slope and a point (NOT the y-intercept)?

through: $(-4, 4)$, slope = -1

Let's start with another form for the equation of a line...

Point-slope Form:

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

slope $\rightarrow m$
point $\rightarrow (x_1, y_1)$

Write the equation of the line

through: $(-4, 4)$, slope = -1

$$y - 4 = -1(x + 4)$$

$$y - 4 = -x - 4$$

$$y = -x$$

Point-slope Form:

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

- Substitute the point into y_1 and x_1 and the slope into m
- Solve for y

Given a point and the slope, write the equation of the line.

through: $(-5, -5)$, slope = $\frac{9}{5}$

$$y - (-5) = \frac{9}{5}(x - (-5))$$

$$y + 5 = \frac{9}{5}(x + 5)$$

$$y + 5 = \frac{9}{5}x + 9$$

$$y = \frac{9}{5}x + 4$$

through: $(-1, -3)$, slope = 2

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

$$y + 3 = 2(x + 1)$$

$$y + 3 = 2x + 2$$

$$y = 2x - 1$$

Point-slope Form:

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

Given two points, write the equation of the line.

through: (5, 4) and (-5, 2)

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

$$m = \frac{4 - 2}{5 - (-5)}$$

$$m = \frac{2}{10} = \frac{1}{5}$$

What do we need to find first?

Slope

Then use EITHER point for substitution into y_1 and x_1

$$y - 4 = \frac{1}{5}(x - 5)$$
$$y - 4 = \frac{1}{5}x - 1$$
$$y = \frac{1}{5}x + 3$$

Given two points, write the equation of the line.

through: $(-3, -5)$ and $(-1, 3)$

$$y = 4x + 7$$

through: $(4, 1)$ and $(1, -2)$

$$y = x - 3$$

through: $(-4, 2)$ and $(-1, 0)$

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

through: $(3, -3)$ and $(5, 5)$

$$y = 4x - 15$$

through: $(-1, 2)$ and $(1, 5)$

$$y = \frac{3}{2}x + \frac{7}{2}$$

through: $(1, -4)$ and $(-2, 5)$

$$y = -3x - 1$$

through: $(-4, 2)$ and $(-1, 0)$

$$m = \frac{2-0}{-4-(-1)} = -\frac{2}{3}$$

$$y - 0 = -\frac{2}{3}(x - (-1))$$

$$y - 0 = -\frac{2}{3}(x + 1)$$

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

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

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

$$y - 2 = -\frac{2}{3}x - \frac{8}{3}$$

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

through: $(1, -4)$ and $(-2, 5)$

$$m = \frac{5 - (-4)}{-2 - 1} = \frac{9}{-3} = -3$$

$$y - (-4) = -3(x - 1)$$

$$y + 4 = -3x + 3$$

$$y = -3x - 1$$

through: $(-1, 2)$ and $(1, 5)$

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

$$y - 5 = \frac{3}{2}(x - 1)$$

$$\begin{array}{l} y - 5 = \frac{3}{2}x - \frac{3}{2} \\ +5 \qquad \qquad \qquad +10 \\ \hline y = \frac{3}{2}x + \frac{7}{2} \end{array}$$

Homework
Worksheet