Essential Question: How do we write the equation of a line from a graph?

Do Now:

A. Determine the slope of the line.
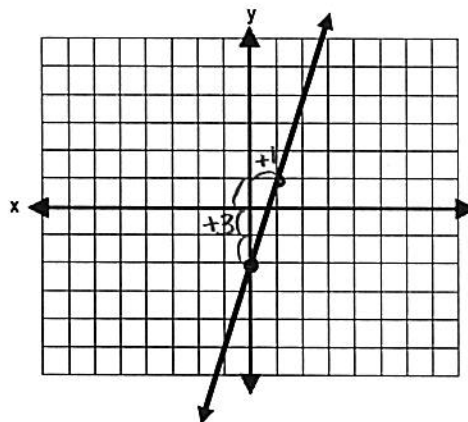
$$\frac{rise}{run} \quad \frac{3}{1} \rightarrow \boxed{3}$$

B. What is the y-intercept of the line?

$$\left(0, -2\right)$$

C. If we know the slope and y-intercept, can we write an equation that represents the graph? Yes

$$y = 3x - 2$$

Writing the Equation of a Line in Slope-Intercept Form $y = mx + b$

Write an equation of a line in slope-intercept form given the information below.

1) m = 4 b = -3

$$y = 4x - 3$$

2) m = -3 b = 7

$$y = -3x + 7$$

3) slope: -1 y-int: 1

$$y = -x + 1$$

4) slope: $\frac{2}{3}$ y-int: 0

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

5) slope: 0 y-int: -2
   (horizontal line)

$$y = -2$$

6) slope: undefined x-int: 3
   (vertical line)

$$x = 3$$
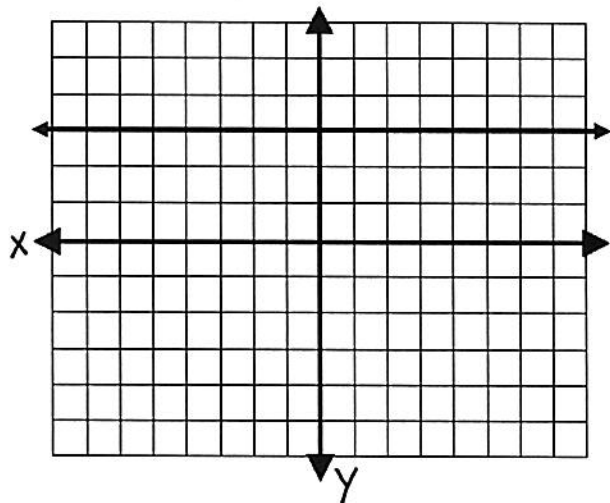
Writing the Equation of a Line from a Graph

Step 1: Determine the slope of the line (m)
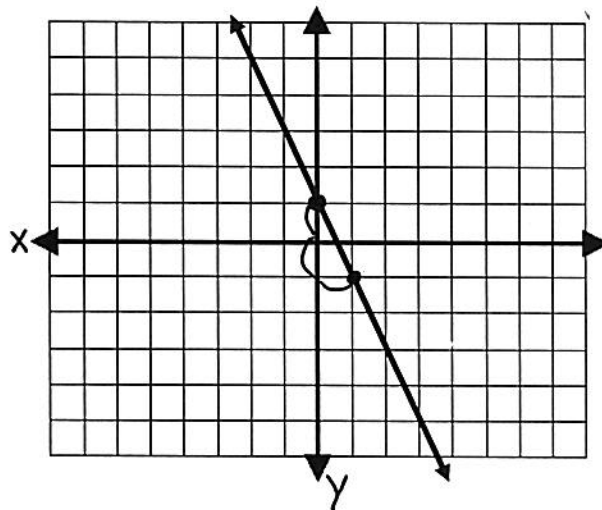**Step 2:** Determine the y-intercept of the line (b)
Step 3: Write the equation of the line in slope-intercept form (y = mx + b)
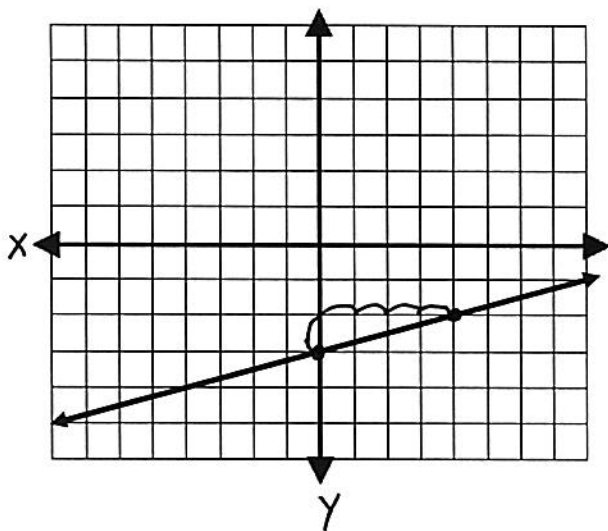
See examples on the next page.
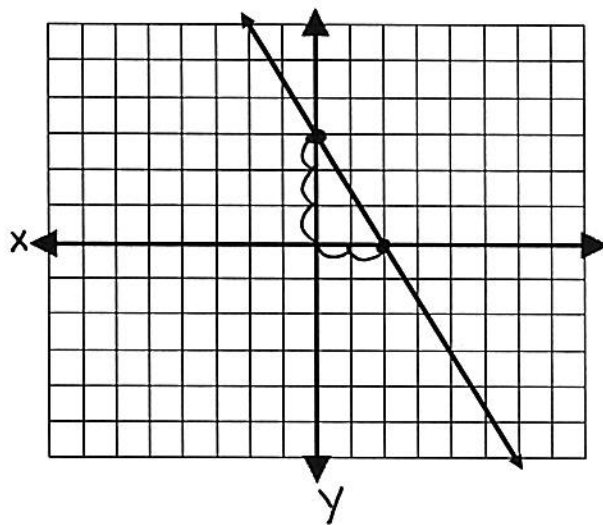
7) horizontal : $m = 0$
   line
   $b = 3$

$y = 3$

8) $m = -\dfrac{2}{1}$
   $y = -2x + 1$
   $b = 1$

9) $m = \dfrac{1}{4}$
   $y = \dfrac{1}{4}x - 3$
   $b = -3$

10) $m = -\dfrac{3}{2}$
    $y = -\dfrac{3}{2}x + 3$
    $b = 3$

Think about this...

When the y-intercept is an integer it is fairly easy to calculate the exact relationship between x and y. Let's try writing the equation of a line where the y-intercept is not an integer.

11) Find the equation of the linear function graphed at right. Determine if your equation is correct by testing it with a point on the line.

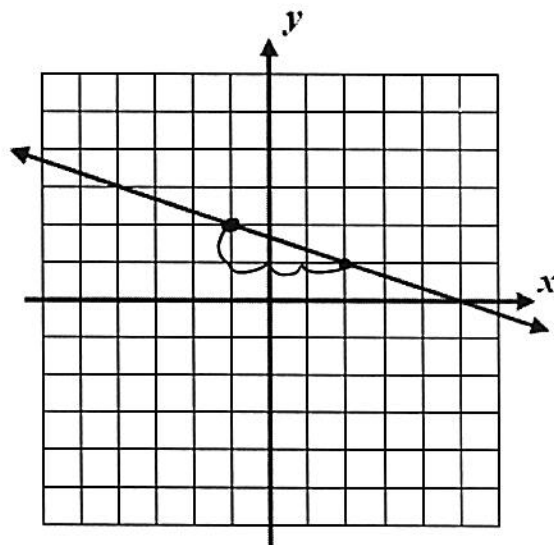$$m = -\frac{1}{3} \qquad b = \text{between 1 and 2}$$

$$y = mx + b \qquad (2, 1)$$

$$1 = -\frac{1}{3}(2) + b$$

$$1 = -\frac{2}{3} + b$$

$$\frac{5}{3} = b$$

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

Turn and Talk

1) Determine the slope and y-intercept of each graph below. Write the equation of the line. Each letter represents a different line.

$$m = 0$$

a) $b = 5 \qquad y = 5$

$$m = \text{undefined}$$

b) $\text{x-int} = -5 \qquad x = -5$

$$m = \frac{1}{1}$$

c) $b = 0 \qquad y = x$

$$m = \frac{-3}{1}$$

d) $b = 1 \qquad y = -3x + 1$