

Skill Check:

If the relation is a function, determine if it is linear or non linear.

$$y = 3$$

**4-1 Writing equations
in Slope -Intercept Form**

Vocabulary:

1.) Slope int From

$$y = mx + b$$

2.) Linear Model

A linear function that models a real-life situation.

Example 1

Using slope and y int. to write equations

Steps:

1.) put Slope in for m

2.) put y-int in for b

Slope = -3 y- int = 1/2

a. $y = mx + b$ Write the slope-intercept form.

$y = -3x + \frac{1}{2}$ Substitute -3 for m and $\frac{1}{2}$ for b.

► An equation is $y = -3x + \frac{1}{2}$.

Slope = 0 y-int = -2

b. $y = mx + b$ Write the slope-intercept form.

$y = 0x + (-2)$ Substitute 0 for m and -2 for b.

$y = -2$ Simplify.

► An equation is $y = -2$.

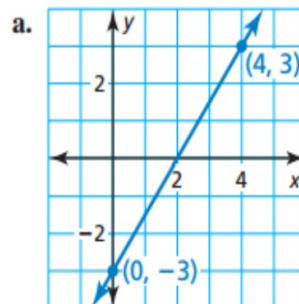
Example 2

Using graphs to write equations

Steps:

1.) Find the slope

2.) Find the y - int



a. Find the slope and y-intercept.

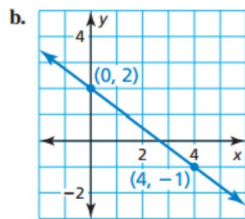
Let $(x_1, y_1) = (0, -3)$ and $(x_2, y_2) = (4, 3)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-3)}{4 - 0} = \frac{6}{4}, \text{ or } \frac{3}{2}$$

Because the line crosses the y-axis at $(0, -3)$, the y-intercept is -3.

► So, the equation is $y = \frac{3}{2}x - 3$.

Practice



b. Find the slope and y-intercept.

Let $(x_1, y_1) = (0, 2)$ and $(x_2, y_2) = (4, -1)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 2}{4 - 0} = \frac{-3}{4}, \text{ or } -\frac{3}{4}$$

Because the line crosses the y-axis at $(0, 2)$, the y-intercept is 2.

► So, the equation is $y = -\frac{3}{4}x + 2$.

example 3 Using points to write equations

Steps:

1.) use slope equation
to find slope

2.) Look to see where
 $x = 0$ to find the y-int

a. $(-3, 5), (0, -1)$

a. Find the slope and y-intercept.

$$m = \frac{-1 - 5}{0 - (-3)} = -2$$

Because the line crosses the y-axis
at $(0, -1)$, the y-intercept is -1 .

► So, an equation is
 $y = -2x - 1$.

Practice

b. $(0, -5), (8, -5)$

b. Find the slope and y-intercept.

$$m = \frac{-5 - (-5)}{8 - 0} = 0$$

Because the line crosses the y-axis at $(0, -5)$, the y-intercept is -5 .

► So, an equation is
 $y = -5$.

Example 4 Writing a linear function

Steps:

1.) Write as an order pair

2.) Find the slope

3.) Find the y - int

Write a linear function f with the values $f(0) = 10$ and $f(6) = 34$.

example 5: Real-Life

Step:

1.) Understand the problem

2.) Make a plan

3.) Solve the problem

EXAMPLE 5 Modeling with Mathematics

Excluding hydropower, U.S. power plants used renewable energy sources to generate 105 million megawatt hours of electricity in 2007. By 2012, the amount of electricity generated had increased to 219 million megawatt hours. Write a linear model that represents the number of megawatt hours generated by non-hydropower renewable energy sources as a function of the number of years since 2007. Use the model to predict the number of megawatt hours that will be generated in 2017.

1. Understand the Problem You know the amounts of electricity generated in two distinct years. You are asked to write a linear model that represents the amount of electricity generated each year since 2007 and then predict a future amount.

2. Make a Plan Break the problem into parts and solve each part. Then combine the results to help you solve the original problem.

Part 1 Define the variables. Find the initial value and the rate of change.

Part 2 Write a linear model and predict the amount in 2017.

3. Solve the Problem

Part 1 Let x represent the time (in years) since 2007 and let y represent the number of megawatt hours (in millions). Because time x is defined in years since 2007, 2007 corresponds to $x = 0$ and 2012 corresponds to $x = 5$. Let $(x_1, y_1) = (0, 105)$ and $(x_2, y_2) = (5, 219)$. The initial value is the y -intercept b , which is 105. The rate of change is the slope m .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{219 - 105}{5 - 0} = \frac{114}{5} = 22.8$$

Part 2

Megawatt hours (millions)	=	Initial value	+	Rate of change	•	Years since 2007
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$$y = 105 + 22.8 \cdot x$$

$$y = 105 + 22.8x \quad \text{Write the equation.}$$

2017 corresponds to $x = 10$. $\rightarrow y = 105 + 22.8(10)$ Substitute 10 for x .

$$y = 333 \quad \text{Simplify.}$$

► The linear model is $y = 22.8x + 105$. The model predicts non-hydropower renewable energy sources will generate 333 million megawatt hours in 2017.

4. Look Back To check that your model is correct, verify that $(0, 105)$ and $(5, 219)$ are solutions of the equation.