

LESSON

Reteach

4-4 Graphing Functions

There are three steps to graphing a function.

Graph $f(x) = |x| + 2$.

Remember that $f(x)$ is function notation for y , so rewrite the function as $y = |x| + 2$.

Step 1: Generate points.

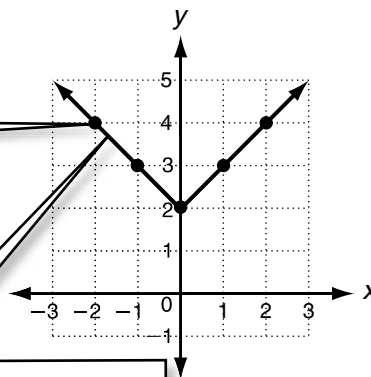
Unless a domain is given, you can pick any values of x .

Step 2: Plot points.

Step 3: Connect points.

Connect the points with a smooth line or curve.

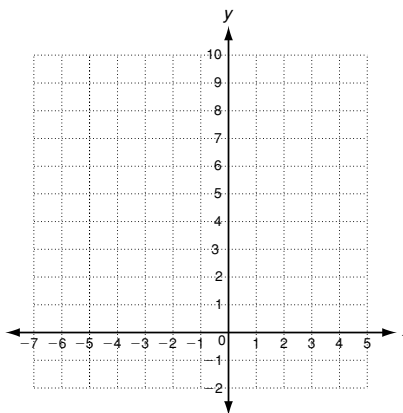
x	$y = x + 2$	(x, y)
-2	$y = -2 + 2 = 2 + 2 = 4$	$(-2, 4)$
-1	$y = -1 + 2 = 1 + 2 = 3$	$(-1, 3)$
0	$y = 0 + 2 = 0 + 2 = 2$	$(0, 2)$
1	$y = 1 + 2 = 1 + 2 = 3$	$(1, 3)$
2	$y = 2 + 2 = 2 + 2 = 4$	$(2, 4)$



Graph each function.

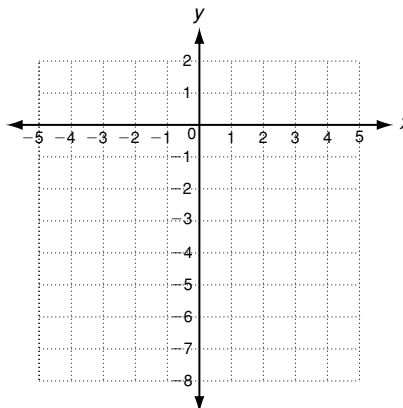
1. $y = (x + 2)^2$

x	$y = (x + 2)^2$	(x, y)
-4	$y = (-4 + 2)^2 = (-2)^2 = \underline{\quad}$	
-3	$y = (-3 + 2)^2 = (\underline{\quad})^2 = \underline{\quad}$	
-2	$y = (\underline{\quad} + 2)^2 = (\underline{\quad})^2 = \underline{\quad}$	
-1	$y = (\underline{\quad})^2 = (\underline{\quad})^2 = \underline{\quad}$	
0	$y = \underline{\quad}$	



2. $f(x) = \frac{1}{2}x - 3$

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



LESSON

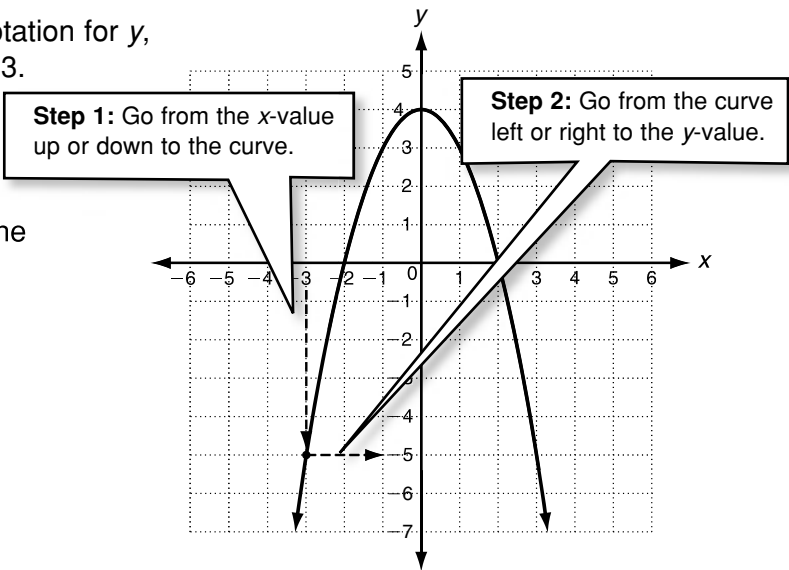
Reteach

4-4 Graphing Functions (continued)

You can use the graph of a function to find points that are generated by the function.

Use the graph of $f(x) = -x^2 + 4$ to find the value of $f(x)$ when $x = -3$.

Remember that $f(x)$ is function notation for y , so you need to find y when $x = -3$.

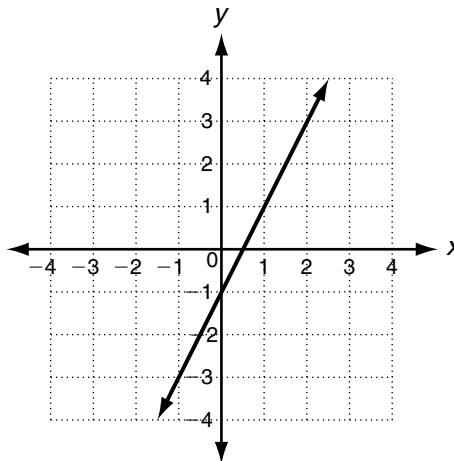


Because $(-3, -5)$ is a point on the graph of the function,

$f(x) = -5$ when $x = -3$.

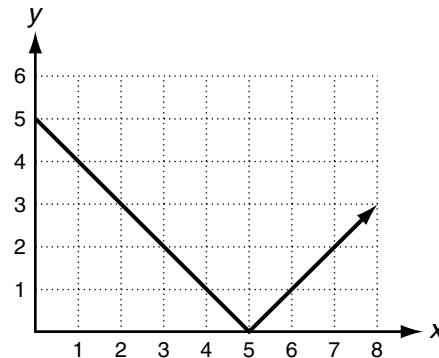
Use this graph of $f(x) = 2x - 1$ to find these values.

- 3. $f(x) = \underline{\hspace{2cm}}$ when $x = -1$
- 4. $f(x) = \underline{\hspace{2cm}}$ when $x = 1$
- 5. $f(x) = \underline{\hspace{2cm}}$ when $x = \frac{1}{2}$



Use this graph of $f(x) = |5 - x|$ to find these values.

- 6. $f(x) = \underline{\hspace{2cm}}$ when $x = 2$
- 7. $f(x) = \underline{\hspace{2cm}}$ when $x = 6$
- 8. $x = \underline{\hspace{2cm}}$ when $f(x) = 0$

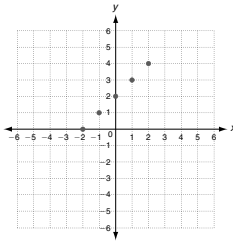


LESSON **Practice A**
4-4 **Graphing Functions**

Graph the function for the given domain.

1. $y = x + 2$; D: $\{-2, -1, 0, 1, 2\}$

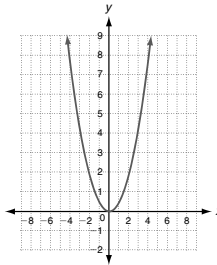
x	$y = x + 2$	(x, y)
-2	$y = -2 + 2$	$(-2, 0)$
-1	$y = -1 + 2$	$(-1, 1)$
0	$y = 0 + 2$	$(0, 2)$
1	$y = 1 + 2$	$(1, 3)$
2	$y = 2 + 2$	$(2, 4)$



Graph the function. The domain is all real numbers.

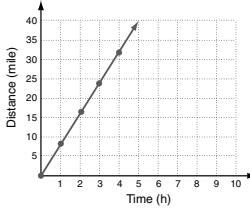
2. $y = x^2 + 2$

x	$y = x^2 + 2$	(x, y)
-4	$y = (-4)^2 + 2$	$(-4, 8)$
-2	$y = (-2)^2 + 2$	$(-2, 2)$
0	$y = (0)^2 + 2$	$(0, 2)$
2	$y = (2)^2 + 2$	$(2, 2)$
4	$y = (4)^2 + 2$	$(4, 8)$



3. A Pacific salmon can swim at a maximum speed of 8 mi/h. The function $y = 8x$ describes how many miles y the fish swims in x hours. Graph the function. Use the graph to estimate the number of miles the fish swims in 3.5 hours.

x	$y = 8x$	(x, y)
0	$y = 8(0)$	$(0, 0)$
1	$y = 8(1)$	$(1, 8)$
2	$y = 8(2)$	$(2, 16)$
3	$y = 8(3)$	$(3, 24)$
4	$y = 8(4)$	$(4, 32)$



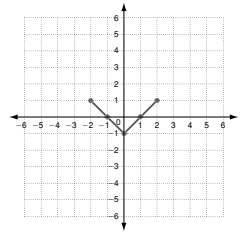
about 28 miles

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LESSON **Practice B**
4-4 **Graphing Functions**

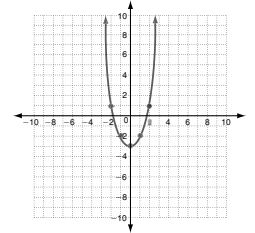
Graph the function for the given domain.

1. $y = |x| - 1$; D: $\{-1, 0, 1, 2, 3\}$

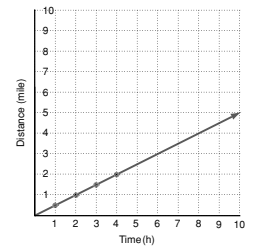


Graph the function.

2. $f(x) = x^2 - 3$



3. One of the slowest fish is the blenny fish. The function $y = 0.5x$ describes how many miles y the fish swims in x hours. Graph the function. Use the graph to estimate the number of miles the fish swims in 3.5 hours.

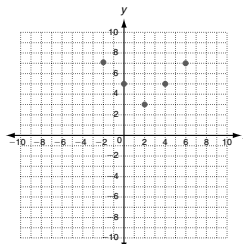


about 1.75 miles

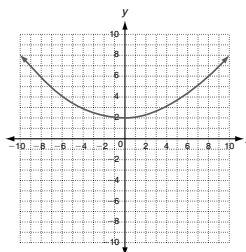
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LESSON **Practice C**
4-4 **Graphing Functions**

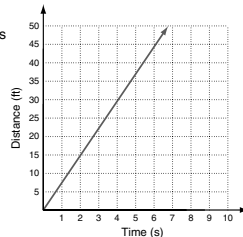
1. Graph $y = |x - 2| + 3$ for the following domain: $\{-2, 0, 2, 4, 6\}$



2. Graph $y = (\frac{x}{4})^2 + 2$.



3. A human being can swim at a maximum rate of 7.4 feet per second. The function $y = 7.4x$ describes how many feet y a person can swim in x seconds. Graph the function. Use the graph to estimate the maximum number of feet a person can swim in 4.5 seconds.



about 33 feet

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LESSON **Reteach**
4-4 **Graphing Functions**

There are three steps to graphing a function.

Graph $f(x) = |x| + 2$.

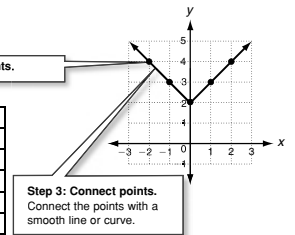
Remember that $f(x)$ is function notation for y , so write the function as $y = |x| + 2$.

Step 1: Generate points.
Unless a domain is given, you can pick any values of x .

Step 2: Plot points.

Step 3: Connect points.
Connect the points with a smooth line or curve.

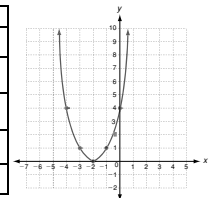
x	$y = x + 2$	(x, y)
-2	$y = -2 + 2 = 2 + 2 = 4$	$(-2, 4)$
-1	$y = -1 + 2 = 1 + 2 = 3$	$(-1, 3)$
0	$y = 0 + 2 = 0 + 2 = 2$	$(0, 2)$
1	$y = 1 + 2 = 1 + 2 = 3$	$(1, 3)$
2	$y = 2 + 2 = 2 + 2 = 4$	$(2, 4)$



Graph each function.

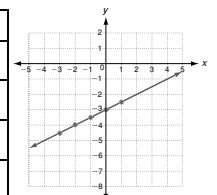
1. $y = (x + 2)^2$

x	$y = (x + 2)^2$	(x, y)
-4	$y = (-4 + 2)^2 = (-2)^2 = 4$	$(-4, 4)$
-3	$y = (-3 + 2)^2 = (-1)^2 = 1$	$(-3, 1)$
-2	$y = (-2 + 2)^2 = (0)^2 = 0$	$(-2, 0)$
-1	$y = (-1 + 2)^2 = (1)^2 = 1$	$(-1, 1)$
0	$y = (0 + 2)^2 = (2)^2 = 4$	$(0, 4)$



2. $f(x) = \frac{1}{2}x - 3$

x	$y = \frac{1}{2}x - 3$	(x, y)
-4	$y = \frac{1}{2}(-4) - 3 = -2 - 3 = -5$	$(-4, -5)$
-2	$y = \frac{1}{2}(-2) - 3 = -1 - 3 = -4$	$(-2, -4)$
0	$y = \frac{1}{2}(0) - 3 = 0 - 3 = -3$	$(0, -3)$
2	$y = \frac{1}{2}(2) - 3 = 1 - 3 = -2$	$(2, -2)$
4	$y = \frac{1}{2}(4) - 3 = 2 - 3 = -1$	$(4, -1)$



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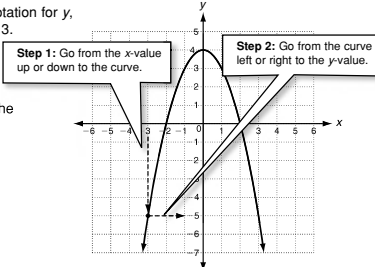
LESSON **Reteach**

4-4 Graphing Functions (continued)

You can use the graph of a function to find points that are generated by the function.

Use the graph of $f(x) = -x^2 + 4$ to find the value of $f(x)$ when $x = -3$.

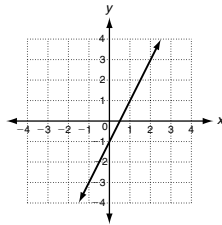
Remember that $f(x)$ is function notation for y , so you need to find y when $x = -3$.



Because $(-3, -5)$ is a point on the graph of the function,
 $f(x) = -5$ when $x = -3$.

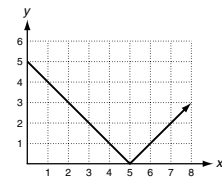
Use this graph of $f(x) = 2x - 1$ to find these values.

- $f(x) = \underline{-3}$ when $x = -1$
- $f(x) = \underline{1}$ when $x = 1$
- $f(x) = \underline{0}$ when $x = \underline{1/2}$



Use this graph of $f(x) = |5 - x|$ to find these values.

- $f(x) = \underline{3}$ when $x = 2$
- $f(x) = \underline{1}$ when $x = 6$
- $x = \underline{5}$ when $f(x) = 0$



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Holt Algebra 1

LESSON **Challenge**

4-4 Composition of Functions

When the output of one function is used as the input of another, you have a **composition of functions**. The notation $f(g(x))$ means you input x into function g , and then use that output as the input for function f .

For 1–5, use the functions $f(x) = x^2 - 4$ and $g(x) = -2x$.

- Use this table to find $f(g(x))$ for each x -value.

x	$g(x) = -2x$	$g(x)$	$f(x) = x^2 - 4$	$f(g(x))$
-2	$g(-2) = -2(-2) = 4$	4	$f(4) = 4^2 - 4 = 16 - 4 = 12$	12
-1	$g(-1) = -2(-1) = 2$	2	$f(2) = 2^2 - 4 = 4 - 4 = 0$	0
0	$g(0) = -2(0) = 0$	0	$f(0) = 0^2 - 4 = 0 - 4 = -4$	-4
1	$g(1) = -2(1) = -2$	-2	$f(-2) = (-2)^2 - 4 = 4 - 4 = 0$	0
2	$g(2) = -2(2) = -4$	-4	$f(-4) = (-4)^2 - 4 = 16 - 4 = 12$	12

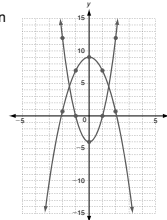
- Use the first and last columns of the table to graph the function $y = f(g(x))$. Connect the points with a smooth curve. Here is the algebra to find a "one-step" rule for $y = f(g(x))$.

$$y = f(g(x)) \quad \text{Write the composite function.}$$

$$y = f(-2x) \quad \text{Because } g(x) = -2x, \text{ substitute } -2x \text{ for } g(x).$$

$$y = (-2x)^2 - 4 \quad \text{Substitute } -2x \text{ for } x \text{ in } f(x) = x^2 - 4.$$

$$y = 4x^2 - 4 \quad \text{Simplify the power: } (-2x)^2 = (-2x)(-2x) = (-2)(-2)(x)(x) = 4x^2.$$



- Use a similar process to find a one-step rule for $y = g(f(x))$.

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

- Complete the table below for $y = g(f(x))$. Then graph the function. Use the same coordinate plane at right.

x	$y = g(f(x)) = -2x^2 + 8$	$(x, g(f(x)))$
-2	$g(f(-2)) = -2(-2)^2 + 8 = -8 + 8 = 0$	$(-2, 0)$
-1	$g(f(-1)) = -2(-1)^2 + 8 = -2 + 8 = 6$	$(-1, 6)$
0	$g(f(0)) = -2(0)^2 + 8 = 0 + 8 = 8$	$(0, 8)$
1	$g(f(1)) = -2(1)^2 + 8 = -2 + 8 = 6$	$(1, 6)$
2	$g(f(2)) = -2(2)^2 + 8 = -8 + 8 = 0$	$(2, 0)$

- Is $f(g(x))$ the same as $g(f(x))$? No

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Holt Algebra 1

LESSON **Problem Solving**

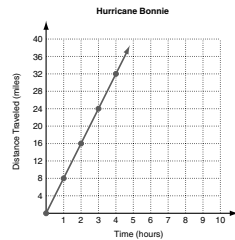
4-4 Graphing Functions

In 1998, Hurricane Bonnie approached the United States at a speed of 8 miles per hour. The function $y = 8x$ describes how many miles y Hurricane Bonnie traveled in x hours.

- Complete the table by generating ordered pairs.

x	$y = 8x$	(x, y)
0	0	(0, 0)
1	8	(1, 8)
2	16	(2, 16)
3	24	(3, 24)
4	32	(4, 32)

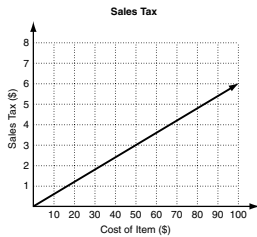
- Graph the function $y = 8x$.



- Use the graph to estimate how far Hurricane Bonnie traveled in 3.5 hours.
28 miles

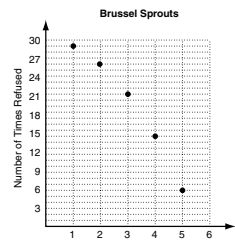
Select the correct answer.

- The graph below shows the relation between the cost of an item and the sales tax due. Which function is graphed below?



- A $y = \frac{6}{x}$ C $y = \frac{x}{6}$
 B $y = 0.06x$ D $y = 6x$

- The graph below shows the relation between Jeremy's age and the number of times per year he refused to eat his brussel sprouts. Which function is graphed for the domain $\{1, 2, 3, 4, 5\}$?



- F $y = 30 - x$ H $y = 30 - x^2$
 G $y = x + 28$ J $y = 29x$

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Holt Algebra 1

LESSON **Reading Strategies**

4-4 Follow a Procedure

Whether graphing a function with a limited domain, or a domain of all real numbers, the procedure is almost the same. The steps of the procedure are listed below and shown in the following example.

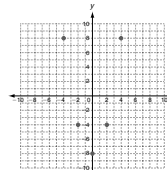
- Step 1:** Create a three-column table headed " x ", " $f(x)$ ", and " $(x, f(x))$ ".
- Step 2:** Write the given or chosen domain values in the " x " column.
- Step 3:** Substitute the domain values into the function and evaluate for $f(x)$.
- Step 4:** Write corresponding x - and $f(x)$ -values as ordered pairs.
- Step 5:** Plot the ordered pairs on a coordinate grid.
- Step 6:** If the domain is all real numbers, connect the points with a smooth line/curve and put arrows on both ends.

Graph the function $f(x) = |x - 2|$.

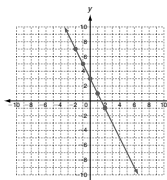
x	$f(x)$	$(x, f(x))$
6	$ 6 - 2 = 4 = 4$	(6, 4)
4	$ 4 - 2 = 2 = 2$	(4, 2)
2	$ 2 - 2 = 0 = 0$	(2, 0)
0	$ 0 - 2 = -2 = 2$	(0, 2)
-2	$ -2 - 2 = -4 = 4$	(-2, 4)

Graph each function using the procedure shown above.

- $f(x) = x^2 - 8$; D: $\{-4, -2, 0, 2, 4\}$



- $f(x) = -2x + 3$



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Holt Algebra 1