

Glencoe McGraw-Hill

Algebra 2



**LESSON
2-7**

Parent Functions and Transformations

Click the mouse button
or press the space bar to continue.

Lesson Menu

Five-Minute Check (over Lesson 2–6)

Then/Now

New Vocabulary

Key Concept: Parent Functions

Example 1: Identify a Function Given the Graph

Example 2: Describe and Graph Translations

Example 3: Describe and Graph Reflections

Example 4: Describe and Graph Dilations

Example 5: Real-World Example: Identify Transformations

Concept Summary: Transformations of Functions

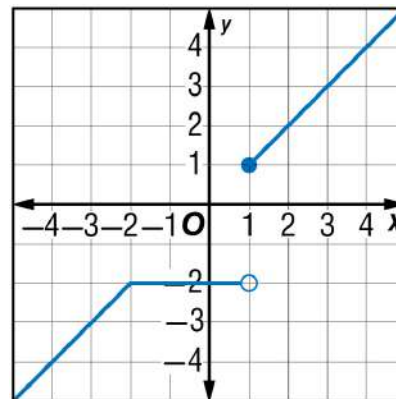


 **5-Minute Check**

Over Lesson 2-6



1 Identify the type of function represented by the graph.



A. linear



B. piecewise

C. absolute value

D. parabolic

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5-Minute Check

Over Lesson 2–6



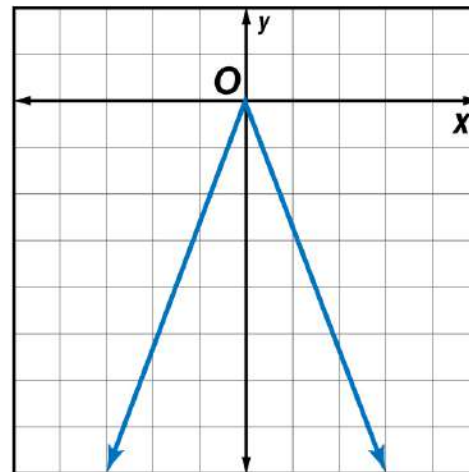
2 Identify the type of function represented by the graph.

A. piecewise

B. linear

C. parabolic

→ D. absolute value

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 **5-Minute Check**

Over Lesson 2–6

Standardized Test Practice

3 The function $f(x) = \left\{ \begin{array}{ll} 5x, & \text{if } x < 8 \\ 8.5x - 1, & \text{if } 8 \leq x < 16 \\ 12x + 4, & \text{if } x \geq 16 \end{array} \right\}$

gives the amount of money earned for working different number of hours. How much will an employee earn for working 12 hours?

A. \$60

 B. \$101

C. \$102

D. \$148

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Then

You analyzed and used relations and functions. (Lesson 2–1)

Now

- Identify and use parent functions.
- Describe transformations of functions.



New Vocabulary

- family of graphs
- parent graph
- parent function
- constant function
- identity function
- quadratic function
- translation
- reflection
- line of reflection
- dilation



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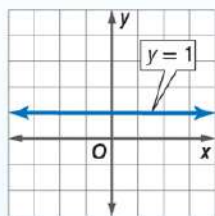


Key Concept

Parent Functions

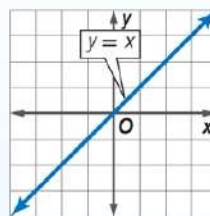
For Your
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Constant Function



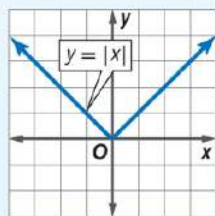
The general equation of a **constant function** is $f(x) = a$, where a is any number. The domain is all real numbers, and the range consists of a single real number a .

Identity Function



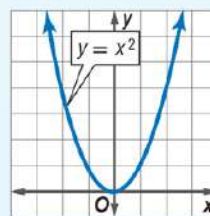
The **identity function** $f(x) = x$ passes through all points with coordinates (a, a) . It is the parent function of most linear functions. Its domain and range are all real numbers.

Absolute Value Function



Recall that the parent function of absolute value functions is $f(x) = |x|$. The domain of $f(x) = |x|$ is the set of real numbers, and the range is the set of real numbers greater than or equal to 0.

Quadratic Function



The parent function of **quadratic functions** is $f(x) = x^2$. The domain of $f(x) = x^2$ is the set of real numbers, and the range is the set of real numbers greater than or equal to 0.



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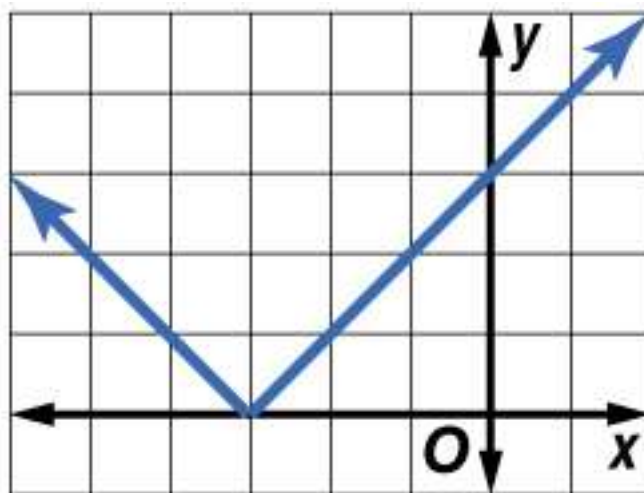
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EXAMPLE 1

Identify a Function Given the Graph

A. Identify the type of function represented by the graph.



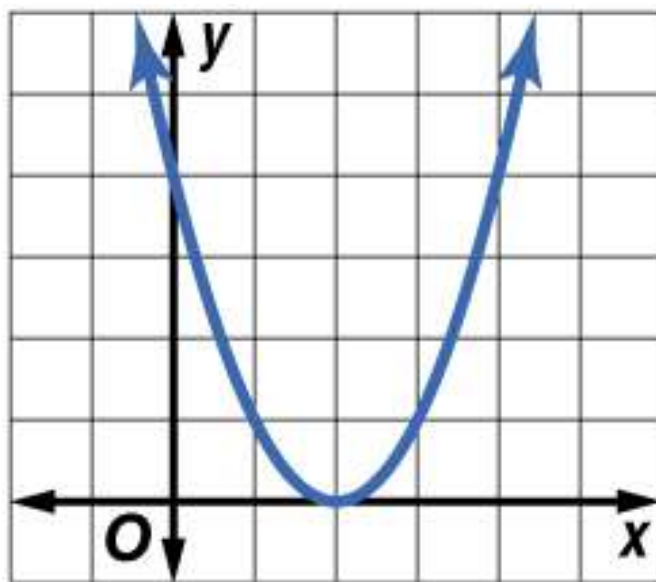
Answer: The graph is a V shape. So, it is an absolute value function.



EXAMPLE 1

Identify a Function Given the Graph

B. Identify the type of function represented by the graph.



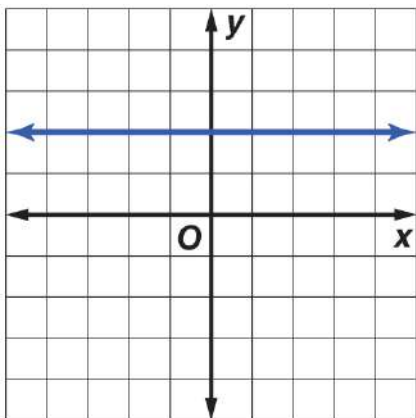
Answer: The graph is a parabola, so it is a quadratic function.



EXAMPLE 1

 Check Your Progress

A. Identify the type of function represented by the graph.



A. absolute value function

B. constant function

C. quadratic function

D. identity variation

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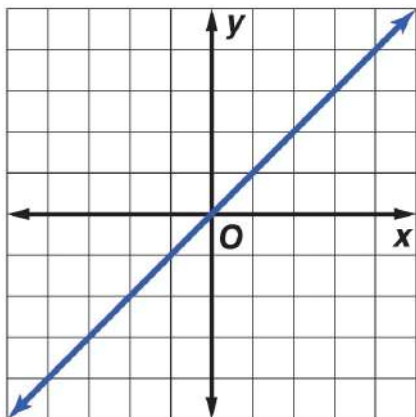
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EXAMPLE 1

 Check Your Progress

B. Identify the type of function represented by the graph.



A. absolute value function

B. constant function

C. quadratic function

D. identity variation

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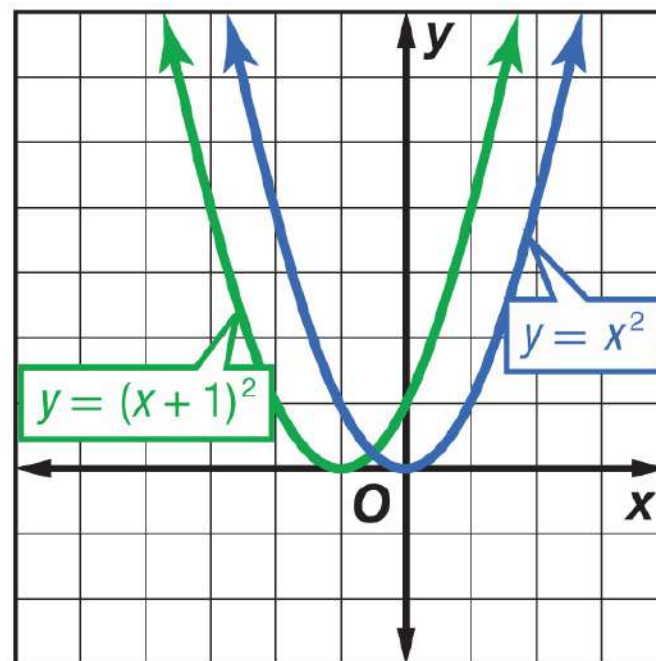


EXAMPLE 2

Describe and Graph Translations

Describe the translation in $y = (x + 1)^2$. Then graph the function.

Answer: The graph of the function $y = (x + 1)^2$ is a translation of the graph of $y = x^2$ left 1 unit.

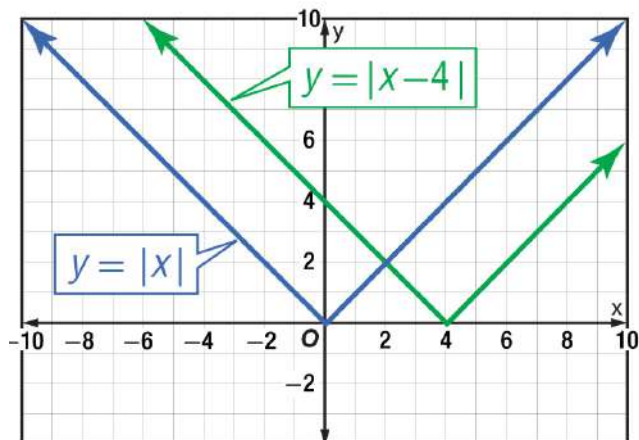


EXAMPLE 2

 Check Your Progress

Describe the translation in $y = |x - 4|$. Then graph the function.

- A. translation of the graph $y = |x|$ up 4 units
- B. translation of the graph $y = |x|$ down 4 units
- C.** translation of the graph $y = |x|$ right 4 units
- D. translation of the graph $y = |x|$ left 4 units

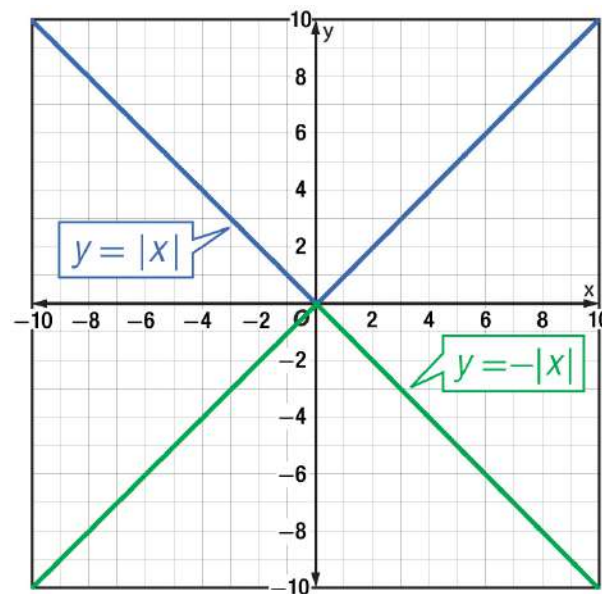


EXAMPLE 3

Describe and Graph Reflections

Describe the reflection in $y = -|x|$. Then graph the function.

Answer: The graph of the function $y = -|x|$ is a reflection of the graph of $y = |x|$ across the x -axis.



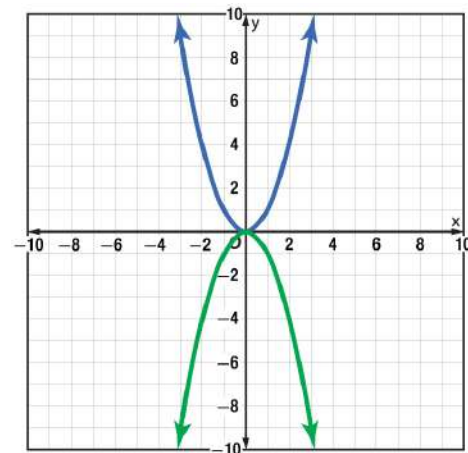
EXAMPLE 3



Check Your Progress



Describe the reflection in $y = -x^2$. Then graph the function.



- A.** reflection of the graph $y = x^2$ across the x -axis
- B.** reflection of the graph $y = x^2$ across the y -axis
- C.** reflection of the graph $y = x^2$ across the line $x = 1$.
- D.** reflection of the graph $y = x^2$ across the $x = -1$

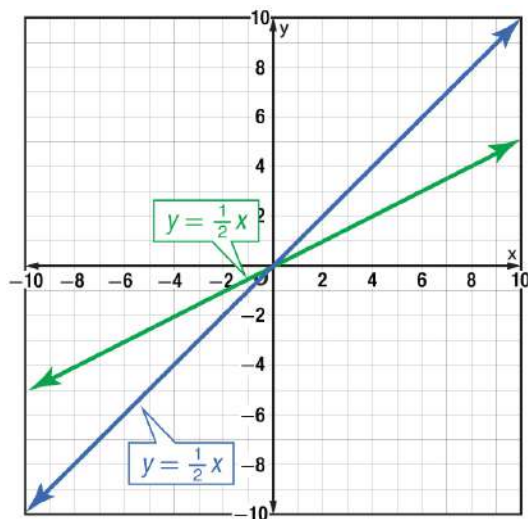


EXAMPLE 4

Describe and Graph Dilations

Describe the dilation on $y = \frac{1}{2}|x|$. Then graph the function.

Answer: The graph of $y = \frac{1}{2}|x|$ is a dilation of the graph $y = |x|$. The graph of $y = \frac{1}{2}|x|$ has a slope that is less steep than the graph of $y = |x|$.



EXAMPLE 4



Check Your Progress



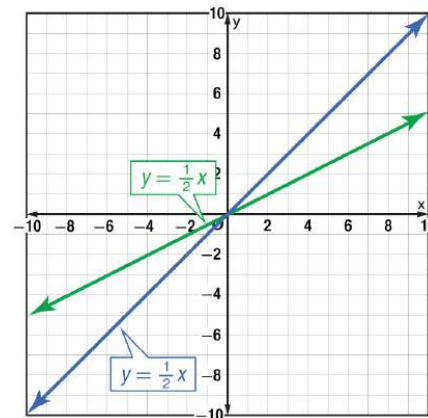
Describe the dilation in $y = |2x|$.
Then graph the function.

A. dilation fo the graph of $y = |x|$
compressed vertically

B. dilation fo the graph of $y = |x|$
stretched vertically

C. dilation fo the graph of $y = |x|$
translated 2 units up

D. dilation fo the graph of $y = |x|$
translated 2 units right



 Real-World Example 5

Identify Transformations

ARCHWAYS The function $f(x) = -\frac{1}{2}(x - 5)^2 + 12.5$

can be used to represent a parabolic archway.

Describe the transformations in the function.

Then graph the function.



 Real-World Example 5

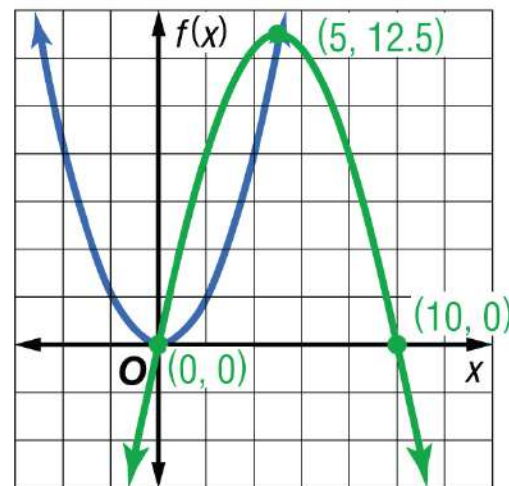
Identify Transformations

Answer:

-5 translates $f(x) = x^2$ right 5 units.

$+12.5$ translates $f(x) = x^2$ up 12.5 units.

$-\frac{1}{2}$ reflects $f(x) = x^2$ across the x -axis and expands the graph.



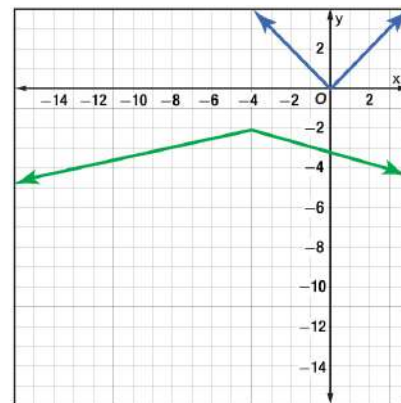
 Real-World Example 5

 Check Your Progress



Which of the following is *not* an accurate description of the transformations in the function

$$f(x) = -\frac{1}{4} |x + 4| - 2$$



A. $+4$ translates $f(x) = |x|$ right 4 units

B. -2 translates $f(x) = |x|$ down 2 units

C. $-\frac{1}{4}$ translates $f(x) = |x|$ across the x -axis

D. $-\frac{1}{4}$ translates $f(x) = |x|$ right 4 units



Concept Summary

Transformations of Functions

For Your
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Transformation	Change to Parent Graph
<p>Translation</p> <p>$f(x + h)$</p> <p>$f(x - h)$</p> <p>$f(x) + k$</p> <p>$f(x) - k$</p>	<p>Translates graph h units left.</p> <p>Translates graph h units right.</p> <p>Translates graph k units up.</p> <p>Translates graph k units down.</p>
<p>Reflection</p> <p>$-f(x)$</p> <p>$f(-x)$</p>	<p>Reflects graph in the x-axis.</p> <p>Reflects graph in the y-axis.</p>
<p>Dilation</p> <p>$a \cdot f(x), a > 1$</p> <p>$a \cdot f(x), 0 < a < 1$</p> <p>$f(bx), a > 1$</p> <p>$f(bx), 0 < a < 1$</p>	<p>Stretches graph vertically.</p> <p>Compresses graph vertically</p> <p>Compresses graph horizontally.</p> <p>Expands graph horizontally.</p>



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**Click the mouse
button to return
to the Lesson Menu.**



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