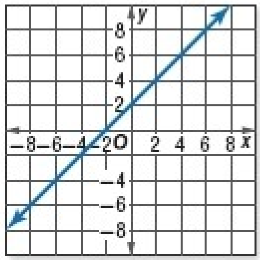
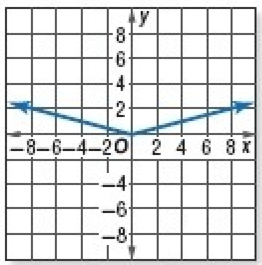
# 2-7 Parent Functions and Transformations

**Identify the type of function represented by each graph.**

1. 

*SOLUTION:*

The function is linear because the graph is a straight line.

2. 

*SOLUTION:*

The graph is in the shape of a V. So, the graph represents an absolute value function.

**CCSS SENSE-MAKING Describe the translation in each function. Then graph the function.**

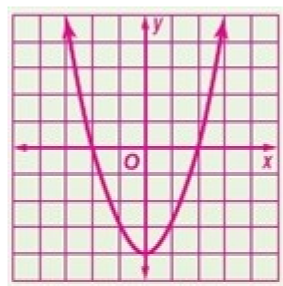
3. $y = x^2 - 4$

*SOLUTION:*

When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a *translation* of the graph up or down.

Here 4 is subtracted from the parent function $y = x^2$.

So it is a translation of the graph of $y = x^2$ down 4 units.



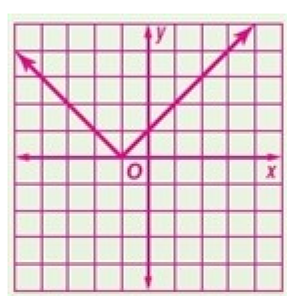
4. $y = |x + 1|$

*SOLUTION:*

When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a *translation* left or right.

Here 1 is added to $x$, the independent variable of the parent function $y = |x|$.

So it is a translation of the graph $y = |x|$ left 1 unit.

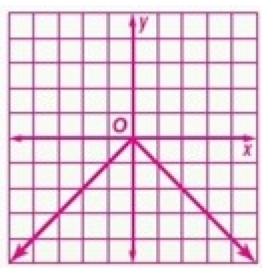


**Describe the reflection in each function. Then graph the function.**

5. $y = -|x|$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

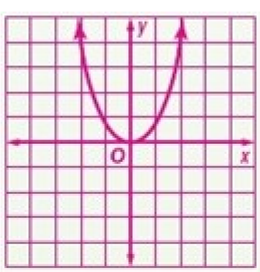
So, the graph of $y = -|x|$ is a reflection of the graph of $y = |x|$ across the $x$-axis.




6. $y = (-x)^2$

*SOLUTION:*
A *reflection* flips a figure over a line, called a line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

So, the graph of $y = (-x)^2$ is a reflection of the graph of $y = x^2$ across the $y$-axis.



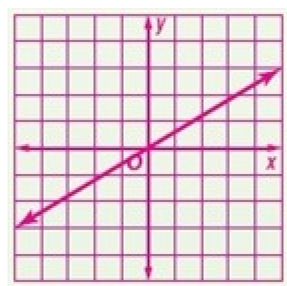

**Describe the dilation in each function. Then graph the function.**

7. $y = \frac{3}{5}x$

*SOLUTION:*
A *vertical compression* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number the result is a graph that is dilated.

So, the graph of $y = \frac{3}{5}x$ is a dilation of the graph of $y = x$.

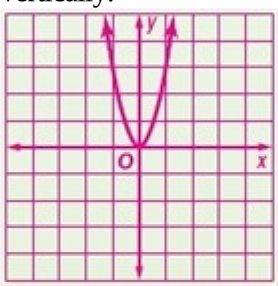
The slope of $y = \frac{3}{5}x$ is not as steep as that of $y = x$.



8. $y = 3x^2$

*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the function is stretched or compressed vertically.
Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.
The variable $x$ in the parent function $y = x$ is multiplied by 3. So, the graph will be stretched vertically.




9. **FOOD** The manager of a coffee shop is randomly checking cups of coffee drinks prepared by employees to ensure that the correct amount of coffee is in each cup. Each 12-ounce drink should contain half coffee and half steamed milk. The amount of coffee by which each drink varies can be represented by $f(x) = \frac{1}{2}|x - 12|$.

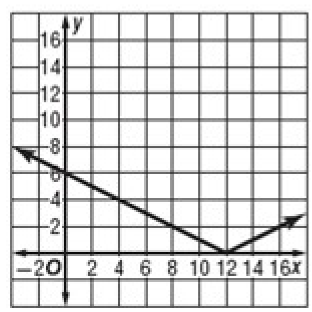
Describe the transformations in the function. Then graph the function.

*SOLUTION:*

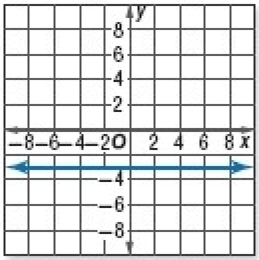
A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the function is stretched or compressed vertically.

When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a translation left or right.

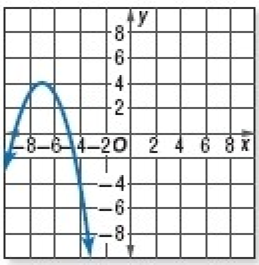
So, the function $f(x) = \frac{1}{2}|x - 12|$ is a dilation and a translation. The graph of $f(x) = |x|$ is compressed vertically and translated 12 units to the right.



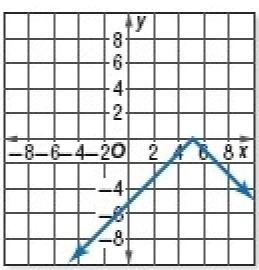
**Identify the type of function represented by each graph.**

10. 

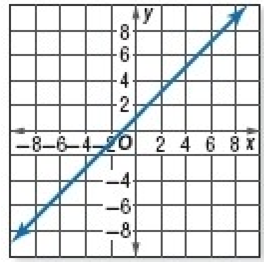

*SOLUTION:*
constant

11. 


*SOLUTION:*
quadratic

12. 


*SOLUTION:*
absolute value

13. 

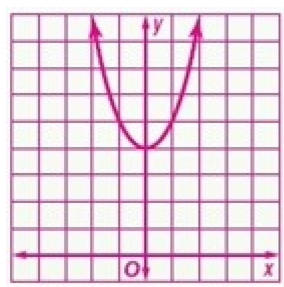

*SOLUTION:*
linear

**Describe the translation in each function. Then graph the function.**

14. $y = x^2 + 4$

*SOLUTION:*
When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a *translation* of the graph up or down.
4 is added with $x^2$.

So, the graph of $y = x^2 + 4$ is a translation of the graph of $y = x^2$ up 4 units.



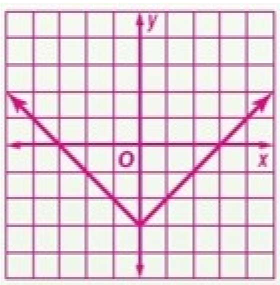
## 2-7 Parent Functions and Transformations

15. $y = |x| - 3$

*SOLUTION:*

When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a *translation* of the graph up or down.

3 is subtracted from $|x|$. So the graph of $y = |x| - 3$ is a translation of the graph of $y = |x|$ down 3 units.



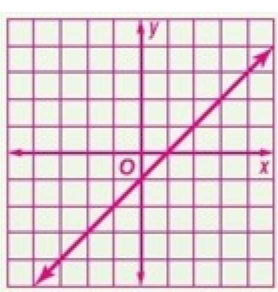

16. $y = x - 1$

*SOLUTION:*

When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a *translation* left or right.

When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a *translation* of the graph up or down.

So, the graph of $y = x - 1$ can be thought of as a translation of the graph of $y = x$ down 1 unit, or as a translation to the right 1 unit.



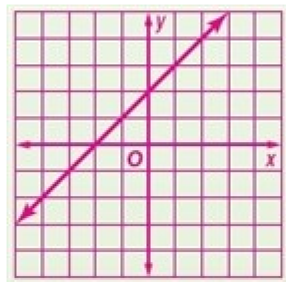

17. $y = x + 2$

*SOLUTION:*

When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a *translation* left or right.

When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a *translation* of the graph up or down.

So, the graph of $y = x + 2$ can be thought of as a translation of the graph of $y = x$ up 2 units, or as a translation to the left 2 units.

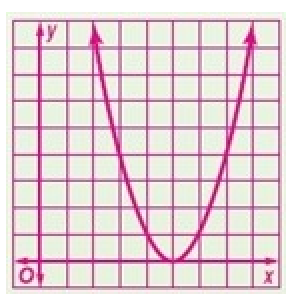



18. $y = (x - 5)^2$

*SOLUTION:*

When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a *translation* left or right.

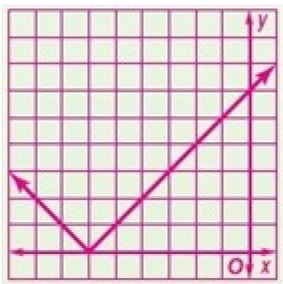
So, the graph of $y = (x - 5)^2$ is a translation of the graph of $y = x^2$ right 5 units.



19. $y = |x + 6|$

*SOLUTION:*
When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a *translation* left or right.

So, the graph of $y = |x + 6|$ is a translation of the graph of $y = |x|$ left 6 units.

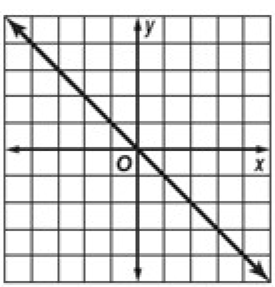



**Describe the reflection in each function. Then graph the function.**

20. $y = -x$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

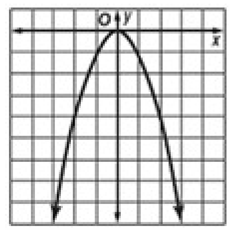
So, the graph of $y = -x$ is a reflection of the graph of $y = x$ across the $x$-axis.




21. $y = -x^2$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

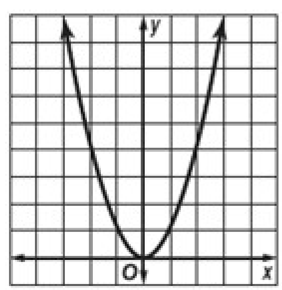
So, the graph of $y = -x^2 = -(x^2)$ is a reflection of the graph of $y = x^2$ across the $x$-axis.




22. $y = (-x)^2$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

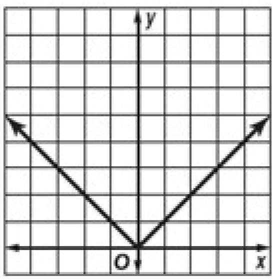
So, the graph of $y = (-x)^2$ is a reflection of the graph of $y = x^2$ across the $y$-axis.



23. $y = |-x|$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

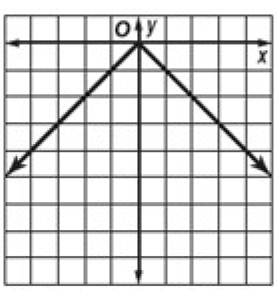
So, the graph of $y = |-x|$ is a reflection of the graph of $y = |x|$ across the $y$-axis.




24. $y = -|x|$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

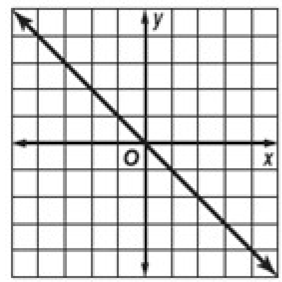
So, the graph of $y = -|x|$ is a reflection of the graph of $y = |x|$ across the $x$-axis.




25. $y = (-x)$

*SOLUTION:*
A *reflection* flips a figure over a line called line of reflection. The reflection $-f(x)$ reflects the graph of $f(x)$ across the $x$-axis and the reflection $f(-x)$ reflects the graph of $f(x)$ across the $y$-axis.

So, the graph of $y = (-x)$ is a reflection of the graph of $y = x$ across the $y$-axis.



**Describe the dilation in each function. Then graph the function.**

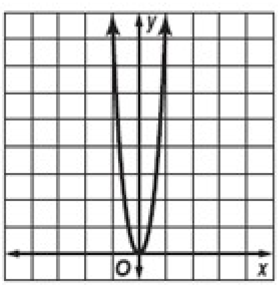
26. $y = (3x)^2$

*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally.

When the variable in a parent function is multiplied by a nonzero number, the function is stretched or compressed horizontally.
Coefficients greater than 1 cause the graph to be compressed, and coefficients between 0 and 1 cause the graph to be stretched.

Here, the coefficient of $x$ is 3. So, the graph of $y = (3x)^2$ is a horizontal compression of the graph of $y = x^2$. (In this case, the transformation can also be considered a vertical stretch.)




27. $y = 6x$

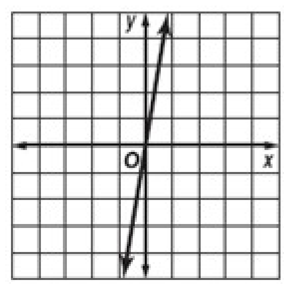
*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the graph is stretched or compressed vertically.

Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.

Here, the parent function $y = x$ is multiplied by 6. So, the graph will be stretched vertically.
(In this case, the transformation can also be considered as a horizontal compression.)

The slope of the line $y = 6x$ is steeper than that of $y = x$.



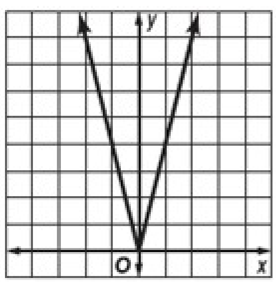
28. $y = 4|x|$

*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the graph is stretched or compressed vertically.

Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.

The parent function $y = |x|$ is multiplied by 4. So, the graph of $y = 4|x|$ is a vertical stretch of the graph of $y = |x|$. (In this case, the transformation can also be considered as a horizontal compression.)




29. $y = |2x|$

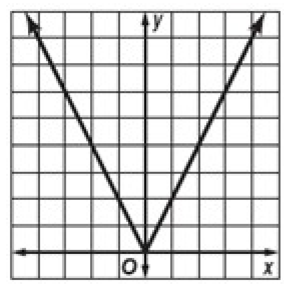
*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When the variable in a linear parent function is multiplied by a nonzero number, the graph is compressed or stretched horizontally.

Coefficients greater than 1 cause the graph to be compressed horizontally and coefficients between 0 and 1 cause the graph to be stretched horizontally.

So, the graph of $y = |2x|$ is a horizontal compression of the graph of $y = |x|$.

(In this case, the transformation can also be considered as a horizontal compression.)



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

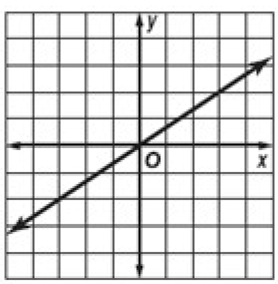
*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the graph is stretched or compressed vertically.

Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.

Here, the coefficient is $\frac{2}{3}$, less than 1. So, the dilation is a vertical compression. (In this case, the transformation can also be considered a horizontal stretch.)

The slope is not as steep as that of $y = x$.




31. $y = \frac{1}{2}x^2$

*SOLUTION:*

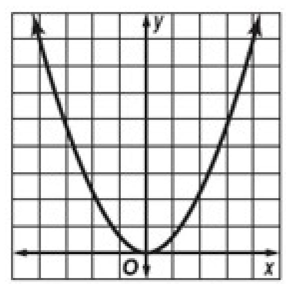
A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the function is stretched or compressed vertically.

Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.

The parent function is $y = x^2$.

The coefficient of $x^2$ is less 1.

So, the dilation is a vertical compression of the the graph of $y = x^2$.
(In this case, the transformation can also be considered as a horizontal stretch.)



32. **CCSS SENSE-MAKING** A non-impact workout can burn up to 7.5 Calories per minute. The equation to represent how many Calories a person burns after $m$ minutes of the workout is $C(m) = 7.5m$.

Identify the transformation in the function. Then graph the function.

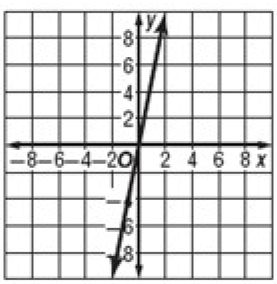
*SOLUTION:*

A *dilation* shrinks or enlarges a figure proportionally. When a parent function is multiplied by a nonzero number, the graph is stretched or compressed vertically.

Coefficients greater than 1 cause the graph to be stretched vertically and coefficients between 0 and 1 cause the graph to be compressed vertically.

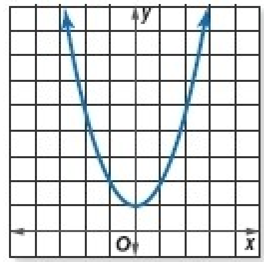
Here, the coefficient is 7.5, greater than 1.

So, the graph of $C(m) = 7.5m$ is a vertical stretch of the graph of $y = x$.
(In this case, the transformation can also be considered as a horizontal stretch.)




**Write an equation for each function.**

33.

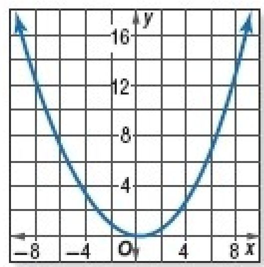



*SOLUTION:*

The graph is a translation of the graph of $y = x^2$ up 1 unit.

So, the equation is $y = x^2 + 1$.

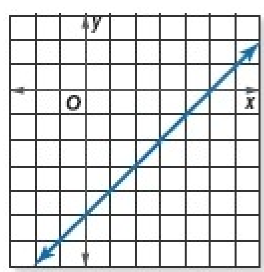
34.




*SOLUTION:*

The graph is a vertical compression of the graph of $y = x^2$.

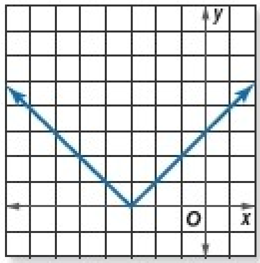
35.




*SOLUTION:*

The graph is a translation of the graph of $y = x$ right 5 units or down 5 units.

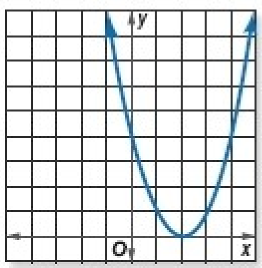
So, the equation is $y = x - 5$.

36. 


*SOLUTION:*

The graph is a translation of the graph of $y = |x|$ left 3 units.

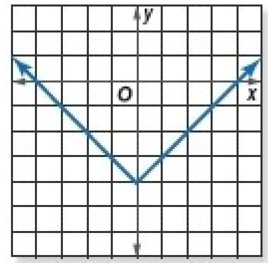
So, the equation is $y = |x + 3|$.

37. 


*SOLUTION:*

The graph is a translation of the graph of $y = x^2$ right 2 units.

So, the equation is $y = (x - 2)^2$.

38. 

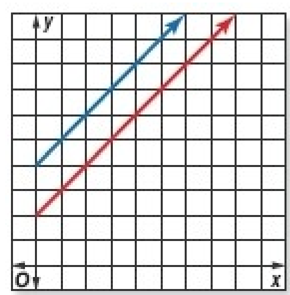

*SOLUTION:*

The graph is a translation of the graph of $y = |x|$ down 4 units.

So, the equation is $y = |x| - 4$.

39. **BUSINESS** The graph of the cost of producing $x$ widgets is represented by the blue line in the graph. After hiring a consultant, the cost of producing $x$ widgets is represented by the red line in the graph.

Write the equations of both lines and describe the transformation from the blue line to the red line.




*SOLUTION:*

The graph of the blue line is a translation of the graph of $y = x$ up 4 units.

So, the equation of the blue line is $y = x + 4$.

The graph of the red line is a translation of the graph of $y = x$ up 2 units.

So, the equation of the red line is $y = x + 2$.

$y = x + 4 = (x + 2) + 2$

Therefore, the graph of the red line is a translation of the graph of blue line 2 units down.

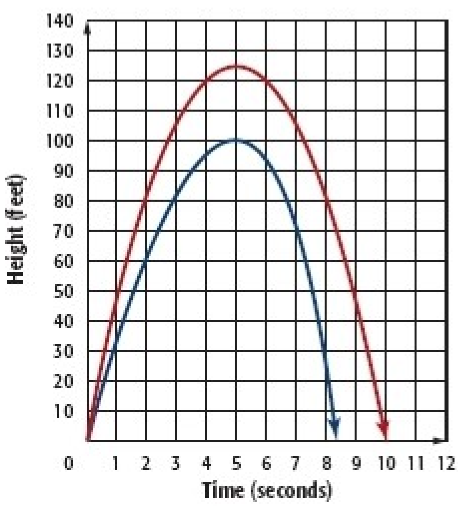
40. **ROCKETRY** Kenji launched a toy rocket from ground level. The height $h(t)$ of Kenji's rocket after $t$ seconds is shown in blue. Emily believed that her rocket could fly higher and longer than Kenji's. The flight of Emily's rocket is shown in red.

**a.** Identify the type of function shown.

**b.** How much longer than Kenji's rocket did Emily's rocket stay in the air?

**c.** How much higher than Kenji's rocket did Emily's rocket go?

**d.** Describe the type of transformation between the two graphs.




*SOLUTION:*

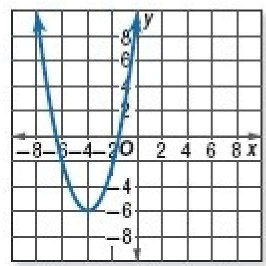
**a.** quadratic.

**b.** Emily's rocket stayed in the air for about 10 seconds and Kenji's rocket stayed in the air for about 8.5 seconds.
Therefore, Emily's rocket stayed in the air about 1.5 seconds more than Kenji's rocket did.

**c.** Emily's rocket reached a height of about 125 ft and Kenji's rocket reached a height of about 100 ft. Therefore, Emily's rocket reached height of about 25 ft more than Kenji's rocket did.

**d.** A dilation in which the red graph is an expansion of the blue graph.

**Write an equation for each function.**

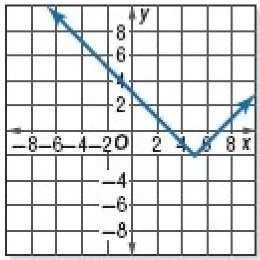
41. 


*SOLUTION:*

The graph is a combination of transformations of the graph of the parent function $y = x^2$.

When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a translation of the graph up or down.
When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a translation left or right.
The graph is moved 6 units down and 4 units left.

So, the equation of the graph is $y = (x + 4)^2 - 6$.

42. 


*SOLUTION:*

The graph is a combination of transformations of the graph of the parent function $y = |x|$.
When a constant $k$ is added to or subtracted from a parent function, the result $f(x) \pm k$ is a translation of the graph up or down.

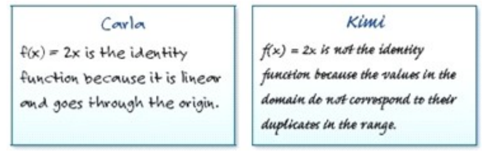
When a constant $h$ is added to or subtracted from $x$ before evaluating a parent function, the result, $f(x \pm h)$, is a translation left or right.
The graph is moved 2 units down and 5 units right.

So, the equation of the graph is $y = |x - 5| - 2$.

43. **CHALLENGE** Explain why performing a horizontal translation followed by a vertical translation ends up being the same transformation as performing a vertical translation followed by a horizontal translation.

*SOLUTION:*
Sample answer: Since a vertical translation concerns only $y$-values and a horizontal translation concerns only $x$-values, order is irrelevant.

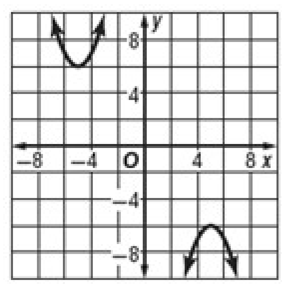
44. **CCSS CRITIQUE** Carla and Kimi are determining if $f(x) = 2x$ is the *identity function*. Is either of them correct? Explain your reasoning.




*SOLUTION:*
Kimi; Sample answer: Linear equations that go through the origin are not always the identity. The identity linear function is $f(x) = x$.

45. **OPEN ENDED** Draw a figure in Quadrant II. Use any of the transformations you learned in this lesson to move your figure to Quadrant IV. Describe your transformation.

*SOLUTION:*
Sample graph:




Sample answer: The figure in Quadrant II has been reflected across the $x$-axis and moved right 10 units.

46. **REASONING** Study the parent graphs at the beginning of this lesson. Select a parent graph with positive $y$-values at its leftmost points and positive $y$-values at its rightmost points.

*SOLUTION:*
Sample answer: The graph of $y = x^2$ is positive at its rightmost points and leftmost points.

47. **WRITING IN MATH** Explain why the reflection of the graph of $f(x) = x^2$ in the $y$-axis is the same as the graph of $f(x) = x^2$. Is this true for all reflections of quadratic equations? If not, describe a case when it is false.

*SOLUTION:*
Sample answer: It is not always true. When the axis of symmetry of the parabola is not along the $y$-axis, the graphs of the preimage and image will be different.

48. What is the solution set of the inequality?

$6-|x+7| \le -2$

**A** $\{x \mid -15 \le x \le 1\}$

**B** $\{x \mid x \le -1 \text{ or } x \ge 3\}$

**C** $\{x \mid -1 \le x \le 3\}$

**D** $\{x \mid x \le -15 \text{ or } x \ge 1\}$

*SOLUTION:*

$$6-|x+7| \le -2$$
$$-|x+7| \le -8$$
$$|x+7| \ge 8$$

This implies:

$$x+7 \le -8 \quad \text{or} \quad x+7 \ge 8$$
$$x \le -15 \quad \text{or} \quad x \ge 1$$

The solution set is $\{x \mid x \le -15 \text{ or } x \ge 1\}$.
The correct choice is **D.**

49. **GEOMETRY** The measures of two angles of a triangle are $x$ and $4x$. Which of these expressions represents the measure of the third angle?

**F** $180 + x + 4x$

**G** $180 - x - 4x$

**H** $180 - x + 4x$

**J** $180 + x - 4x$

*SOLUTION:*
Let $A$ represent the measure of the third angle.
The sum of the interior angles of a triangle is $180°$.
So:

$$A + x + 4x = 180$$
$$A = 180 - x - 4x$$

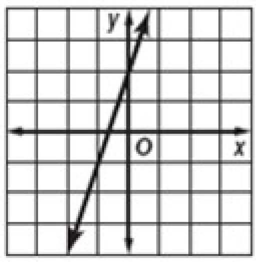
So the correct choice is **G.**

50. **GRIDDED RESPONSE** Find the value of $x$ that makes $\frac{1}{2} = \frac{x-2}{x+2}$ true.

*SOLUTION:*

$$\frac{1}{2} = \frac{x-2}{x+2}$$
$$x+2 = 2(x-2)$$
$$x+2 = 2x-4$$
$$x = 6$$

51. **ACT/SAT** Which could be the inequality for the graph?




**A** $y = 3x + 2$

**B** $y = 3x - 2$

**C** $y = -3x + 2$

**D** $y = -\frac{1}{3}x + 2$

**E** $y = \frac{1}{3}x + 2$

*SOLUTION:*

Consider (0, 0) as a test point.
The point (0,0) satisfies both the inequalities $y < 3x + 2$ and $y \leq 3x + 2$.

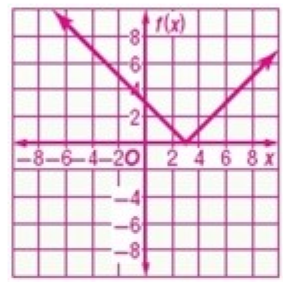
Since the line is dotted, it could be $y < 3x + 2$.

The correct choice is **A.**

**Graph each function. Identify the domain and range.**

52. $f(x) = |x - 3|$

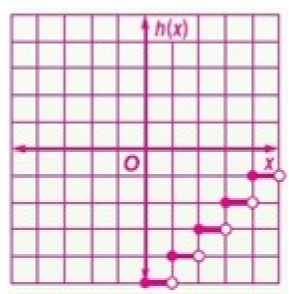
*SOLUTION:*




D = {all real numbers}
$R = \{f(x) | f(x) \geq 0\}$

53. $h(x) = [\![x]\!] - 5$

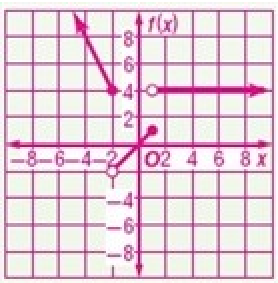
*SOLUTION:*




D = {all real numbers}
R = {all integers}

54. $f(x) = \begin{cases} -2x \text{ if } x \le -2 \\ x \text{ if } -2 < x \le 1 \\ 4 \text{ if } x > 1 \end{cases}$

*SOLUTION:*




D = {all real numbers}

$R = \{f(x) | -2 < f(x) \le 1 \text{ or } f(x) \ge 4\}$

55. **ATTENDANCE** The table shows the annual attendance to West High School's Summer Celebration.

**a.** Find a regression equation for the data.

**b.** Determine the correlation coefficient.

**c.** Predict how many people will attend the Summer Celebration in 2010.

| Year | Attendance |
|---|---|
| 2004 | 61 |
| 2005 | 83 |
| 2006 | 85 |
| 2007 | 92 |
| 2008 | 97 |
| 2009 | 106 |

*SOLUTION:*

**a.** $y = 7.83x - 15620.7$

**b.** $r = 0.953$

**c.** Substitute $x = 2010$ in the equation $y = 7.83x - 15620.70$.

$$\begin{aligned} y &= 7.83(2010) - 15620.70 \\ &= 15738.3 - 15620.70 \\ &\approx 118 \end{aligned}$$

Therefore, about 133 people will attend the Summer Celebration in 2010.

**Solve each inequality.**

56. $-12 \le 2x + 4 \le 8$

*SOLUTION:*

$$\begin{aligned} -12 &\le 2x + 4 \le 8 \\ -12 - 4 &\le 2x + 4 - 4 \le 8 - 4 \\ -16 &\le 2x \le 4 \\ -\frac{16}{2} &\le \frac{2x}{2} \le \frac{4}{2} \\ -8 &\le x \le 2 \end{aligned}$$

57. $-4 < -3y + 2 < 11$

*SOLUTION:*

$$\begin{aligned} -4 &< -3y + 2 < 11 \\ -4 - 2 &< -3y + 2 - 2 < 11 - 2 \\ -6 &< -3y < 9 \\ \frac{-6}{-3} &> \frac{-3y}{-3} > \frac{9}{-3} \\ 2 &> y > -3 \end{aligned}$$

58. $|x - 3| > 7$

*SOLUTION:*

$$\begin{aligned} &|x - 3| > 7 \\ &x - 3 < -7 \quad \text{or} \quad x - 3 > 7 \\ &x < -4 \quad \text{or} \quad x > 10 \end{aligned}$$

59. **CARS** Loren is buying her first car. She is considering 4 different models and 5 different colors. How many different cars could she buy?

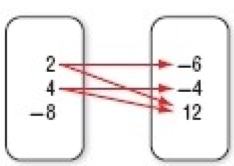
*SOLUTION:*

A model is available in 5 different colors. There are 4 different models.

Therefore, the number of combinations is 20.

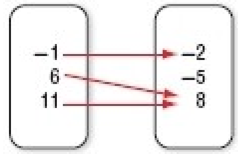
Loren could buy 20 different cars.

**Determine if each relation is a function.**

60. 


*SOLUTION:*

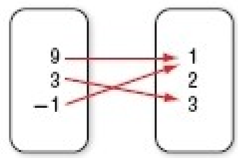
The relation is not a function because 2 and 4 do not correspond to unique element in the range.

61. 


*SOLUTION:*

Each element of the domain is paired with exactly one element in the range.

So, the relation is a function.

62. 


*SOLUTION:*

Each element of the domain is paired with exactly one element in the range.

So, the relation is a function.

**Evaluate each expression if $x = -4$ and $y = 6$.**

63. $4x - 8y + 12$

*SOLUTION:*

$4x - 8y + 12$

Replace $x$ with $-4$ and $y$ with 6.

$$\begin{aligned} 4(-4) - 8(6) + 12 &= -16 - 48 + 12 \\ &= -52 \end{aligned}$$

64. $5y + 3x - 8$

*SOLUTION:*

$5y + 3x - 8$

Replace $x$ with –4 and $y$ with 6.

$$\begin{aligned}5(6)+3(-4)-8 &= 30-12-8\\ &= 10\end{aligned}$$

65. $-12x + 10y - 24$

*SOLUTION:*

$-12x + 10y - 24$

Replace $x$ with –4 and $y$ with 6.

$$\begin{aligned}-12(-4)+10(6)-24 &= 48+60-24\\ &= 84\end{aligned}$$