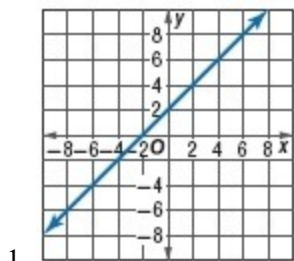


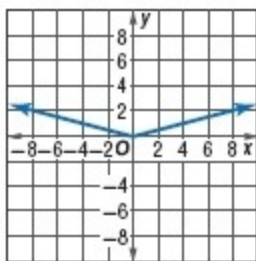
2-7 Parent Functions and Transformations

Identify the type of function represented by each graph.



ANSWER:

linear



ANSWER:

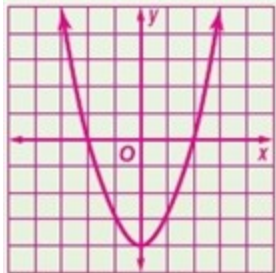
absolute value

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

3. $y = x^2 - 4$

ANSWER:

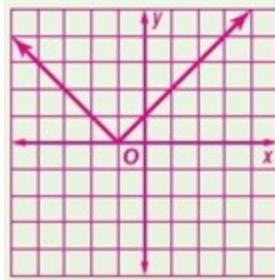
translation of the graph of $y = x^2$ down 4 units



4. $y = |x + 1|$

ANSWER:

translation of the graph of $y = |x|$ left 1 unit

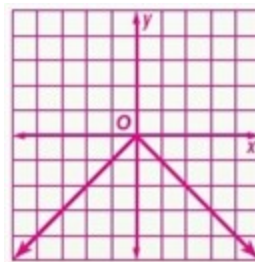


Describe the reflection in each function. Then graph the function.

5. $y = -|x|$

ANSWER:

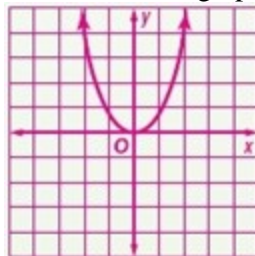
reflection of the graph of $y = |x|$ across the x -axis



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

ANSWER:

reflection of the graph of $y = x^2$ across the y -axis



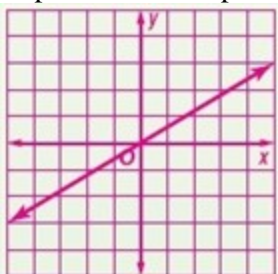
2-7 Parent Functions and Transformations

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

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

ANSWER:

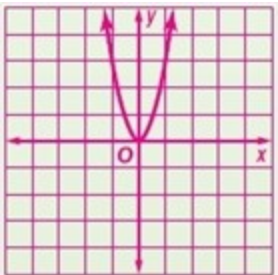
A vertical compression of the graph of $y = x$; the slope is not as steep as that of $y = x$.



8. $y = 3x^2$

ANSWER:

The dilation stretches the graph of $y = x^2$ vertically.

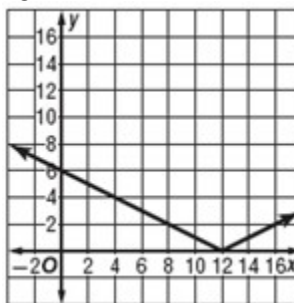


9. **FOOD** The manager of a coffee shop is randomly checking cups of coffee drinks prepared by employees to ensure that the correct amount of coffee is in each cup. Each 12-ounce drink should contain half coffee and half steamed milk. The amount of coffee by which each drink varies can be represented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

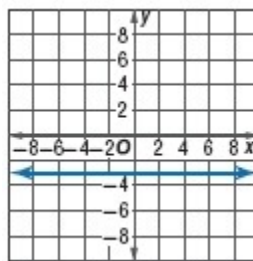
Describe the transformations in the function. Then graph the function.

ANSWER:

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



Identify the type of function represented by each graph.

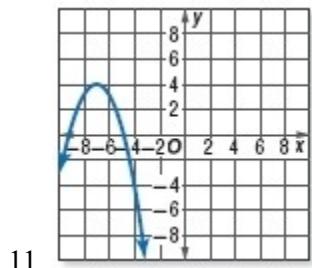


10.

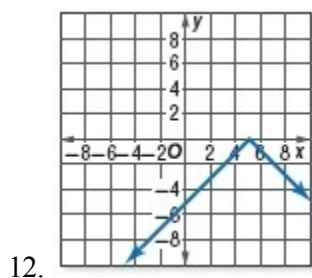
ANSWER:

constant

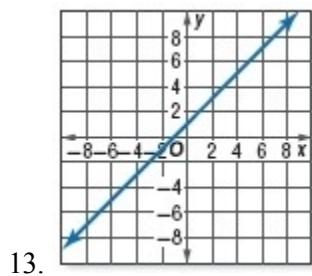
2-7 Parent Functions and Transformations



ANSWER:
quadratic



ANSWER:
absolute value



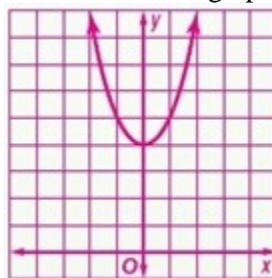
ANSWER:
linear

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

14. $y = x^2 + 4$

ANSWER:

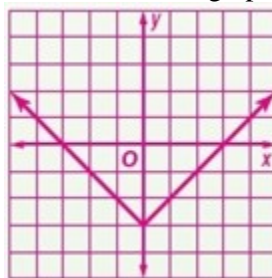
translation of the graph of $y = x^2$ up 4 units



15. $y = |x| - 3$

ANSWER:

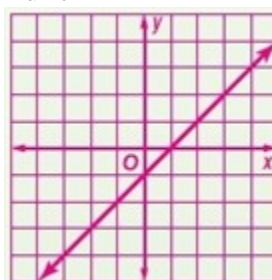
translation of the graph of $y = |x|$ down 3 units



16. $y = x - 1$

ANSWER:

translation of the graph of $y = x$ down 1 unit or right 1 unit

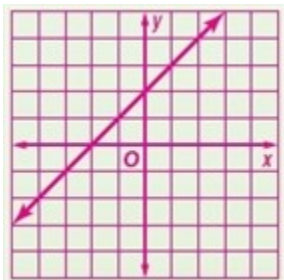


2-7 Parent Functions and Transformations

17. $y = x + 2$

ANSWER:

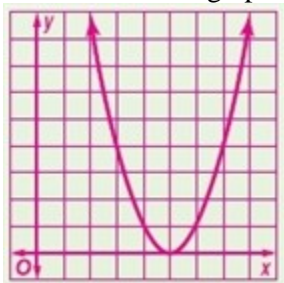
translation of the graph of $y = x$ up 2 units or left 2 units



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

ANSWER:

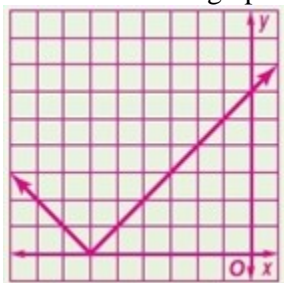
translation of the graph of $y = x^2$ right 5 units



19. $y = |x + 6|$

ANSWER:

translation of the graph of $y = |x|$ left 6 units

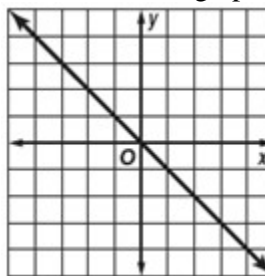


Describe the reflection in each function. Then graph the function.

20. $y = -x$

ANSWER:

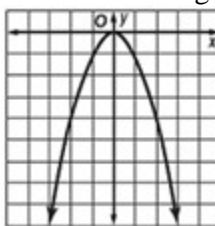
reflection of the graph of $y = x$ across the x -axis



21. $y = -x^2$

ANSWER:

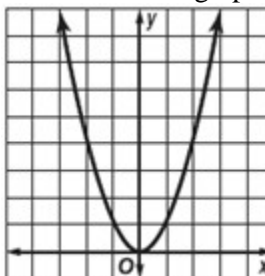
reflection of the graph of $y = x^2$ across the x -axis



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

ANSWER:

reflection of the graph of $y = x^2$ across the y -axis

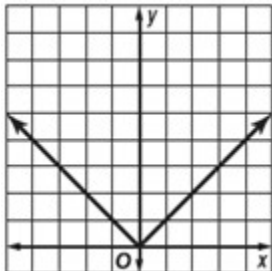


2-7 Parent Functions and Transformations

23. $y = |-x|$

ANSWER:

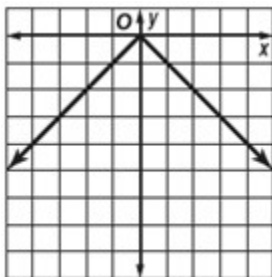
reflection of the graph of $y = |x|$ across the y -axis



24. $y = -|x|$

ANSWER:

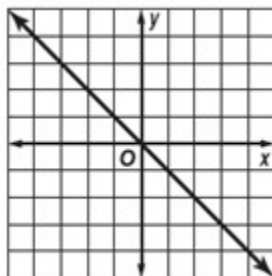
reflection of the graph of $y = |x|$ across the x -axis



25. $y = (-x)$

ANSWER:

reflection of the graph of $y = x$ across the y -axis

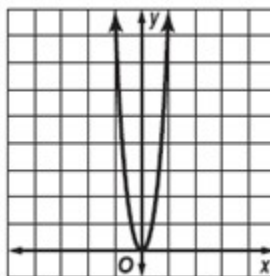


Describe the dilation in each function. Then graph the function.

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

ANSWER:

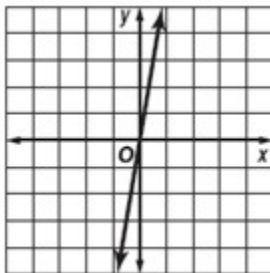
horizontal compression of the graph of $y = x^2$



27. $y = 6x$

ANSWER:

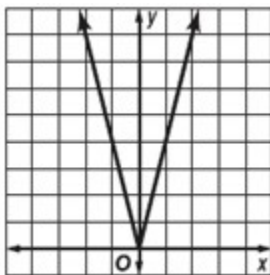
vertical compression of the graph of $y = x$; The slope is steeper than that of $y = x$.



28. $y = 4|x|$

ANSWER:

The dilation stretches the graph of $y = |x|$ vertically.

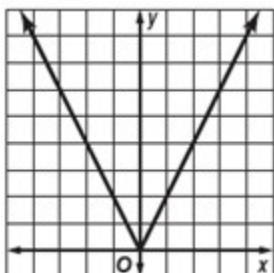


2-7 Parent Functions and Transformations

29. $y = |2x|$

ANSWER:

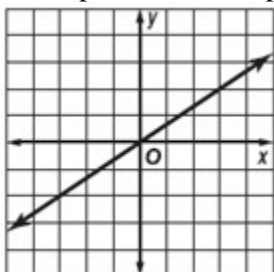
The dilation compressed the graph of $y = |x|$ horizontally.



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

ANSWER:

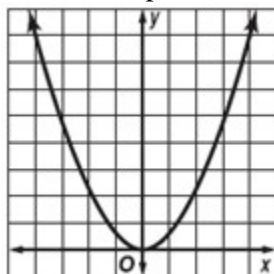
The dilation compressed the graph of $y = x$ vertically; the slope is not as steep as that of $y = x$.



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

ANSWER:

vertical compression of the graph of $y = x^2$

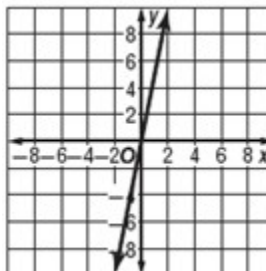


32. **CCSS SENSE-MAKING** A non-impact workout can burn up to 7.5 Calories per minute. The equation to represent how many Calories a person burns after m minutes of the workout is $C(m) = 7.5m$.

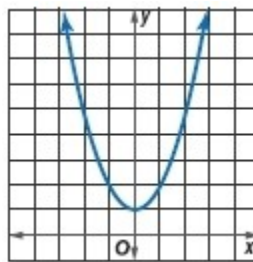
Identify the transformation in the function. Then graph the function.

ANSWER:

The graph is a dilation of the graph of $y = x$. The dilation stretches the graph vertically.



Write an equation for each function.

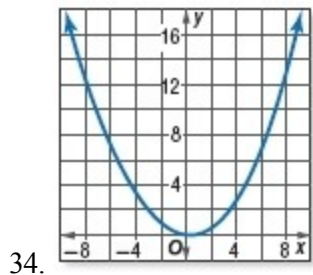


33.

ANSWER:

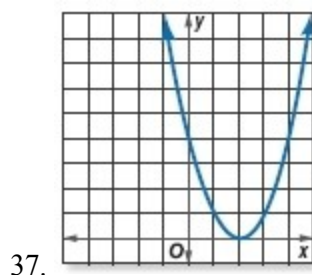
$$y = x^2 + 1$$

2-7 Parent Functions and Transformations



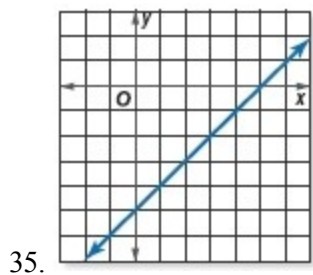
ANSWER:

$$y = \frac{3}{16}x^2$$



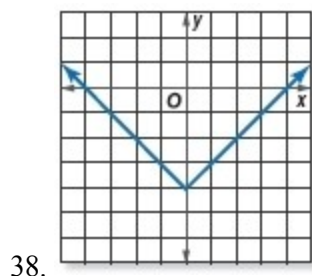
ANSWER:

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



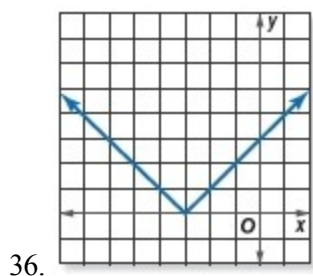
ANSWER:

$$y = x - 5$$



ANSWER:

$$y = |x| - 4$$

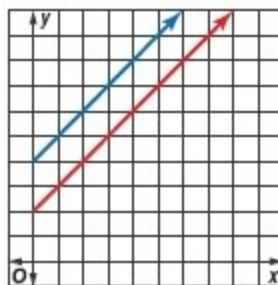


ANSWER:

$$y = |x + 3|$$

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.



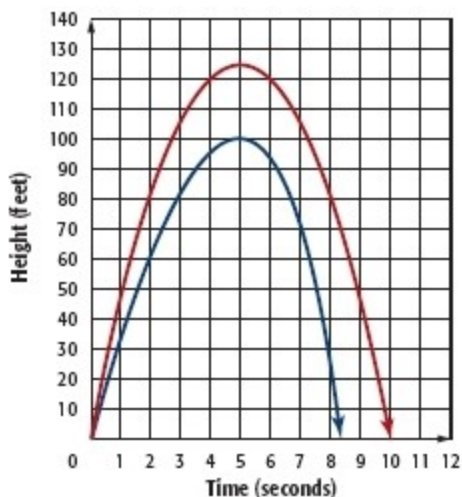
ANSWER:

Blue: $y = x + 4$; red: $y = x + 2$; the red line is a translation of the blue line 2 units down.

2-7 Parent Functions and Transformations

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.

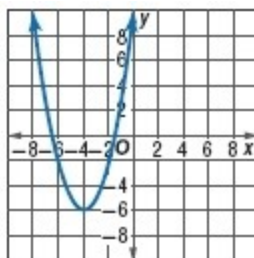
- Identify the type of function shown.
- How much longer than Kenji's rocket did Emily's rocket stay in the air?
- How much higher than Kenji's rocket did Emily's rocket go?
- Describe the type of transformation between the two graphs.



ANSWER:

- quadratic
- about 1.5 seconds
- about 25 ft higher
- a dilation in which the red graph is an expansion of the blue graph

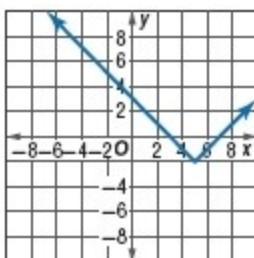
Write an equation for each function.



41.

ANSWER:

$$y = (x + 4)^2 - 6$$



42.

ANSWER:

$$y = |x - 5| - 2$$

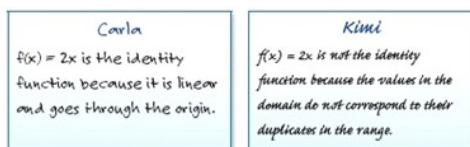
43. **CHALLENGE** Explain why performing a horizontal translation followed by a vertical translation ends up being the same transformation as performing a vertical translation followed by a horizontal translation.

ANSWER:

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

2-7 Parent Functions and Transformations

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



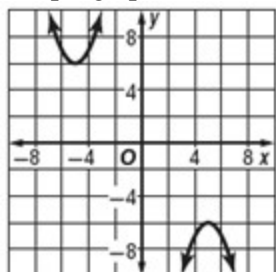
ANSWER:

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.

ANSWER:

Sample graph:



Sample answer: The figure in Quadrant II has been reflected 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.

ANSWER:

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.

ANSWER:

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?

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

- A $\{x \mid -15 \leq x \leq 1\}$
 B $\{x \mid x \leq -1 \text{ or } x \geq 3\}$
 C $\{x \mid -1 \leq x \leq 3\}$
 D $\{x \mid x \leq -15 \text{ or } x \geq 1\}$

ANSWER:

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 $180 + x - 4x$

ANSWER:

G

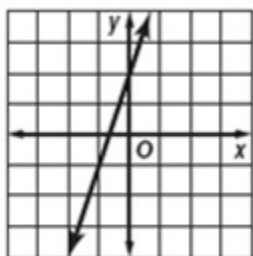
2-7 Parent Functions and Transformations

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

ANSWER:

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

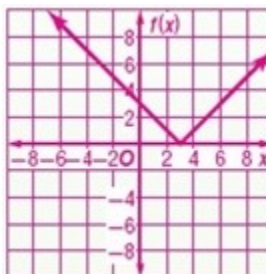
ANSWER:

A

Graph each function. Identify the domain and range.

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

ANSWER:

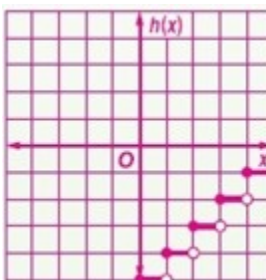


D = {all real numbers}

R = $\{f(x) \mid f(x) \geq 0\}$

53. $h(x) = \llbracket x \rrbracket - 5$

ANSWER:



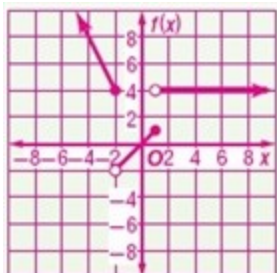
D = {all real numbers}

R = {all integers}

2-7 Parent Functions and Transformations

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

ANSWER:



$D = \{\text{all real numbers}\}$

$R = \{f(x) \mid -2 < f(x) \leq 1 \text{ or } f(x) \geq 4\}$

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

- Find a regression equation for the data.
- Determine the correlation coefficient.
- 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

ANSWER:

- $y = 7.83x - 15620.70$
- $r = 0.953$
- about 118 people

Solve each inequality.

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

ANSWER:

$-8 \leq x \leq 2$

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

ANSWER:

$2 > y > -3$

58. $|x - 3| > 7$

ANSWER:

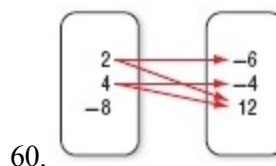
$x < -4 \text{ or } x > 10$

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?

ANSWER:

20

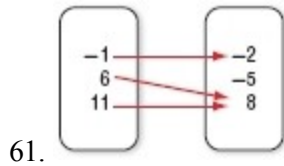
Determine if each relation is a function.



ANSWER:

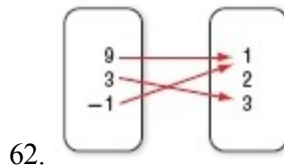
no

2-7 Parent Functions and Transformations



ANSWER:

yes



ANSWER:

yes

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

63. $4x - 8y + 12$

ANSWER:

-52

64. $5y + 3x - 8$

ANSWER:

10

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

ANSWER:

84