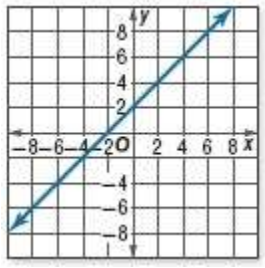
2-6 Parent Functions and Transformations

Identify the type of function represented by each graph.

1. 

ANSWER:

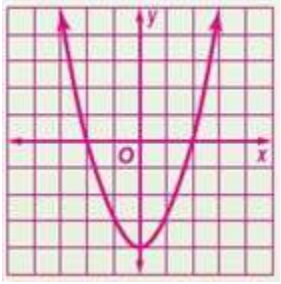
linear

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

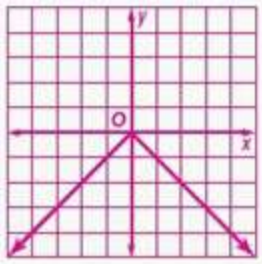


Describe the reflection in each function. Then graph the function.

5. $y = -|x|$

ANSWER:

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

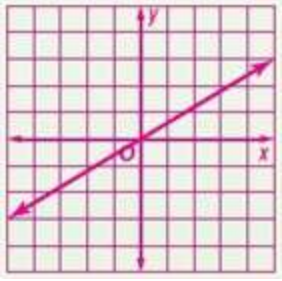


Describe the dilation in each function. Then graph the function.

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

ANSWER:

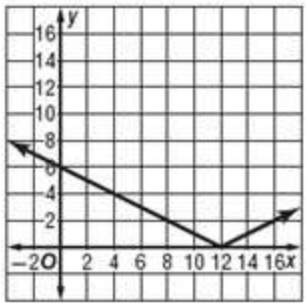
A vertical compression of the graph of $y = x$; the slope is not as steep as that of $y = x$.



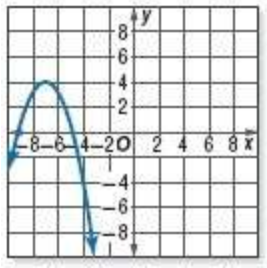
9. **FOOD** The manager of a coffee shop is randomly checking cups of coffee drinks prepared by employees to ensure that the correct amount of coffee is in each cup. Each 12-ounce drink should contain half coffee and half steamed milk. The amount of coffee by which each drink varies can be represented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

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

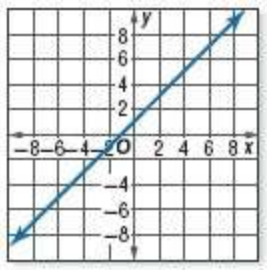
ANSWER:
The function is a dilation and translation. The graph of $f(x) = \frac{1}{2}|x - 12|$ compresses the graph $f(x) = |x|$ vertically and translates it 12 units to the right.



Identify the type of function represented by each graph.

11. 

ANSWER:
quadratic

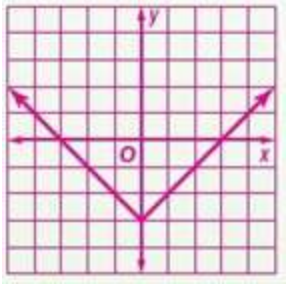
13. 

ANSWER:
linear

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

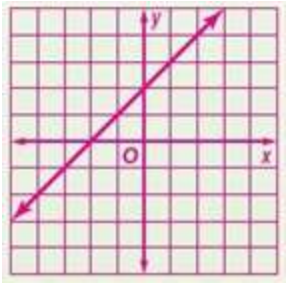
15. $y = |x| - 3$

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



17. $y = x + 2$

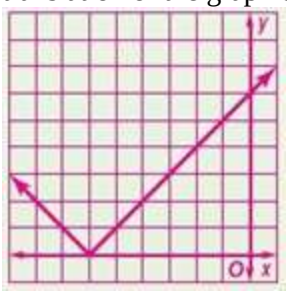
ANSWER:
translation of the graph of $y = x$ up 2 units or left 2 units



19. $y = |x + 6|$

ANSWER:

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

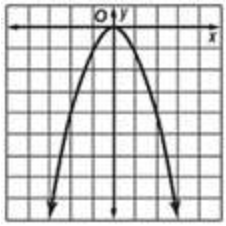


Describe the reflection in each function. Then graph the function.

21. $y = -x^2$

ANSWER:

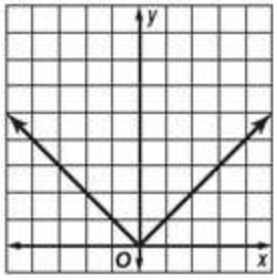
reflection of the graph of $y = x^2$ across the x-axis



23. $y = |-x|$

ANSWER:

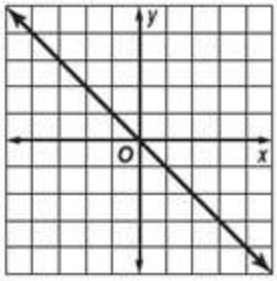
reflection of the graph of $y = |x|$ across the y-axis



25. $y = (-x)$

ANSWER:

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

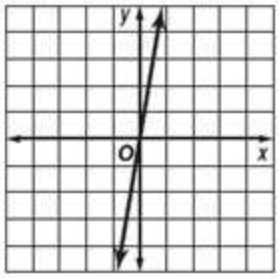


Describe the dilation in each function. Then graph the function.

27. $y = 6x$

ANSWER:

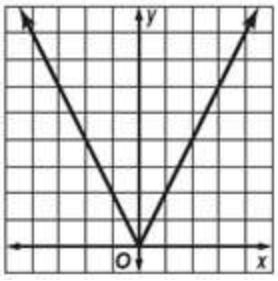
vertical compression of the graph of $y = x$; The slope is steeper than that of $y = x$.



29. $y = |2x|$

ANSWER:

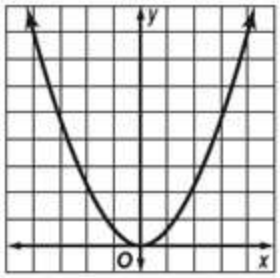
The dilation compressed the graph of $y = |x|$ horizontally.



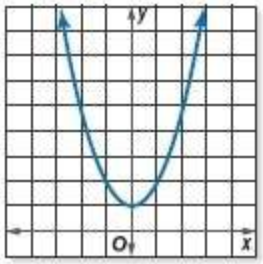
31. $y = \frac{1}{2}x^2$

ANSWER:

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

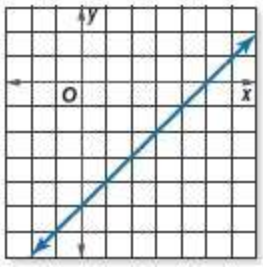


Write an equation for each function.

33. 

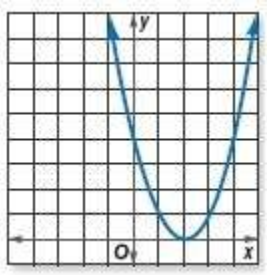
ANSWER:

$y = x^2 + 1$

35. 

ANSWER:

$y = x - 5$

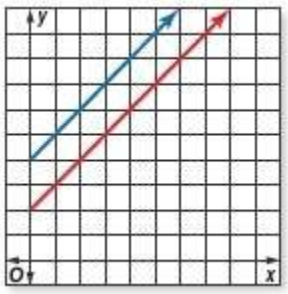
37. 

ANSWER:

$y = (x - 2)^2$

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.

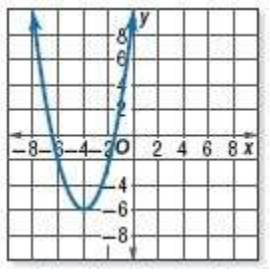
Write the equations of both lines and describe the transformation from the blue line to the red line.



ANSWER:

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

Write an equation for each function.

41. 

ANSWER:

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

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.

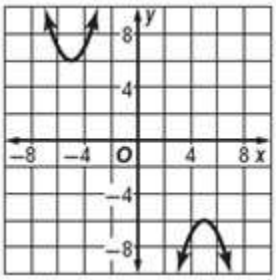
ANSWER:

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

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.

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.

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 $180 - x - 4x$

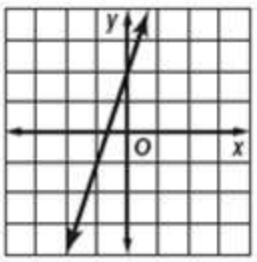
H $180 - x + 4x$

J $180 + x - 4x$

ANSWER:

G

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



A $y = 3x + 2$

B $y = 3x - 2$

C $y = -3x + 2$

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

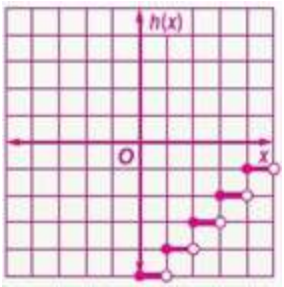
E $y = \frac{1}{3}x + 2$

ANSWER:
A

Graph each function. Identify the domain and range.

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

ANSWER:



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

Solve each inequality.

55. $-4 < -3y + 2 < 11$

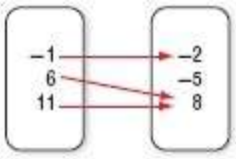
ANSWER:
$2 > y > -3$

57. **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.

59.



ANSWER:
yes

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

61. $4x - 8y + 12$

ANSWER:
−52