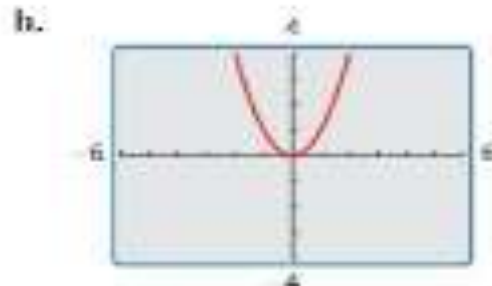
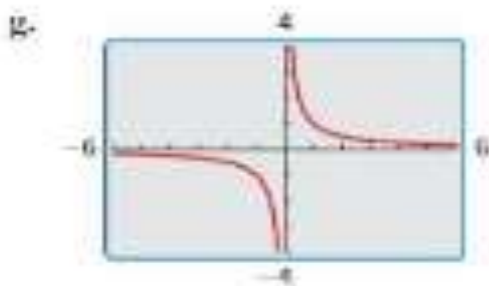
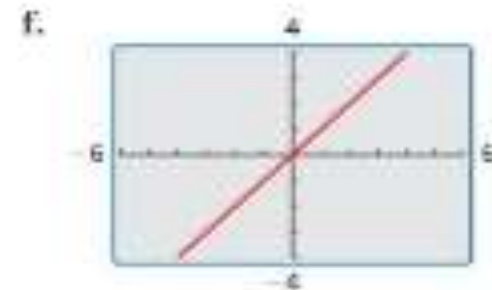
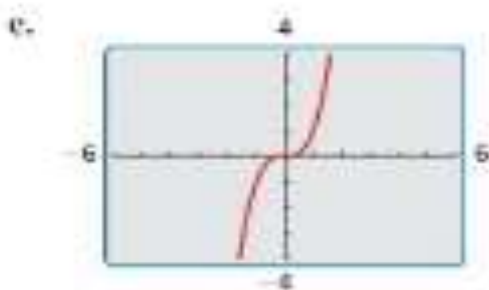
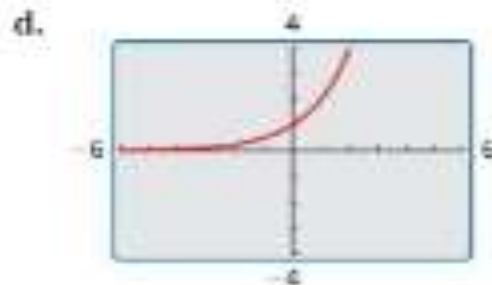
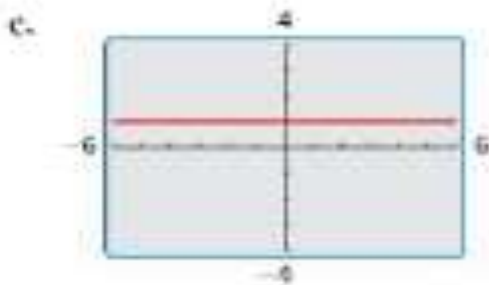
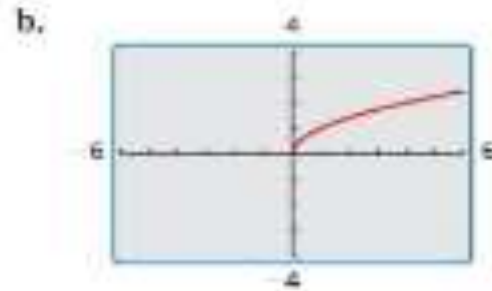
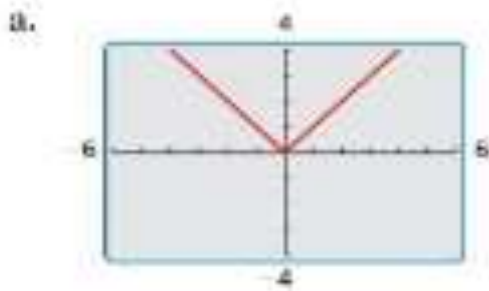


Chapter 1
Linear Functions

Section 1-1
Parent Functions and Transformations

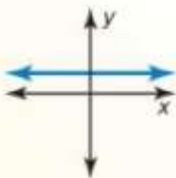
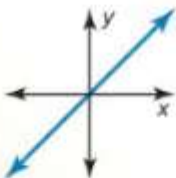
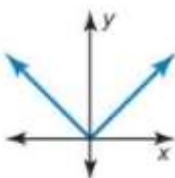
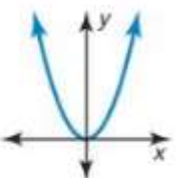
EXPLORATION 1 Identifying Basic Parent Functions

Work with a partner. Graphs of eight basic parent functions are shown below. Classify each function as *constant*, *linear*, *absolute value*, *quadratic*, *square root*, *cubic*, *reciprocal*, or *exponential*. Justify your reasoning.



Core Concept

Parent Functions

Family	Constant	Linear	Absolute Value	Quadratic
Rule	$f(x) = 1$	$f(x) = x$	$f(x) = x $	$f(x) = x^2$
Graph				
Domain	All real numbers	All real numbers	All real numbers	All real numbers
Range	$y = 1$	All real numbers	$y \geq 0$	$y \geq 0$

Describing Transformations

A **transformation** changes the size, shape, position, or orientation of a graph.

A **translation** is a transformation that shifts a graph horizontally and/or vertically but does not change its size, shape, or orientation.

EXAMPLE 2 Graphing and Describing Translations

Graph $g(x) = x - 4$ and its parent function. Then describe the transformation.

REMEMBER

The slope-intercept form of a linear equation is $y = mx + b$, where m is the slope and b is the y -intercept.



Tutorial

A **reflection** is a transformation that flips a graph over a line called the *line of reflection*. A reflected point is the same distance from the line of reflection as the original point but on the opposite side of the line.

EXAMPLE 3 Graphing and Describing Reflections

Graph $p(x) = -x^2$ and its parent function. Then describe the transformation.

REMEMBER

The function $p(x) = -x^2$ is written in *function notation*, where $p(x)$ is another name for y .

Graph the function and its parent function. Then describe the transformation.



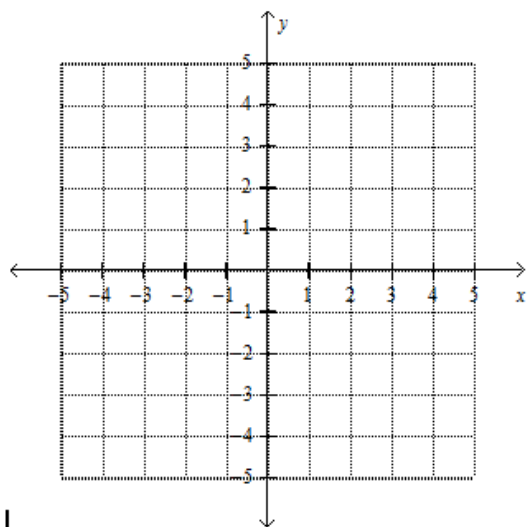
2. $g(x) = x + 3$



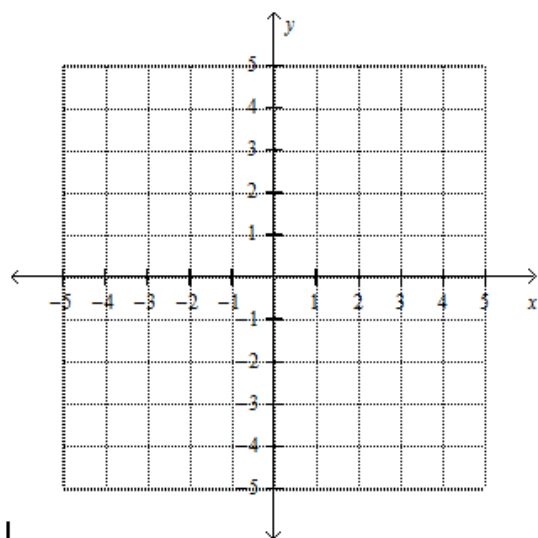
3. $h(x) = (x - 2)^2$



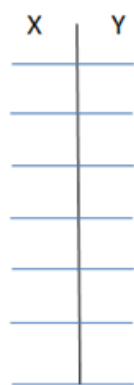
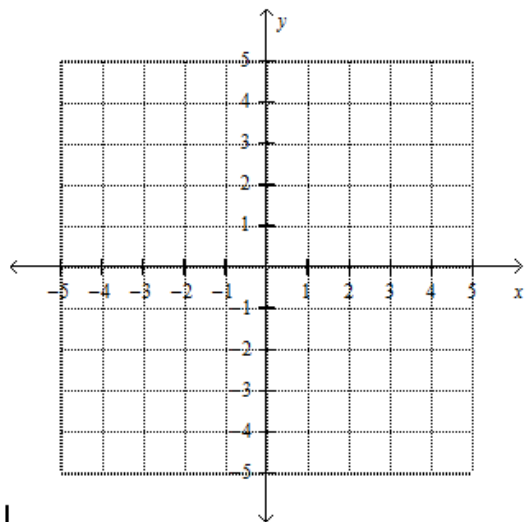
4. $n(x) = -|x|$



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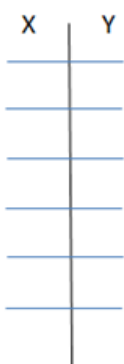
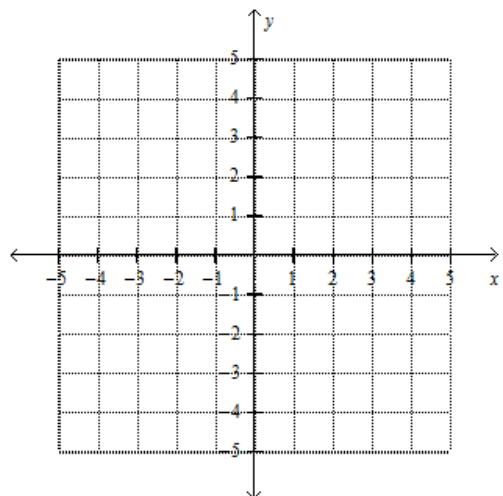
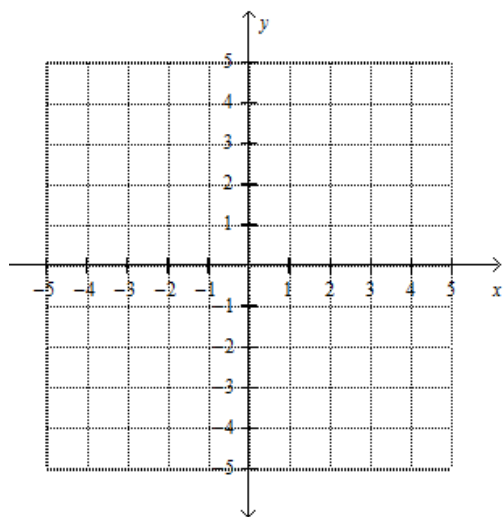
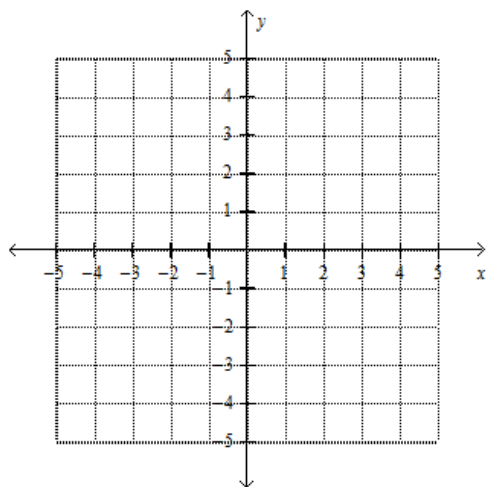
Another way to transform the graph of a function is to multiply all of the y-coordinates by the same positive factor (other than 1). When the factor is greater than 1, the transformation is a **vertical stretch**. When the factor is greater than 0 and less than 1, it is a **vertical shrink**.

Graph the function and its parent function. Then describe the transformation.

5. $g(x) = 3x$

6. $h(x) = \frac{3}{2}x^2$

7. $c(x) = 0.2|x|$



EXAMPLE 5**Describing Combinations of Transformations**

Use a graphing calculator to graph $g(x) = -|x + 5| - 3$ and its parent function. Then describe the transformations.

