

Study Guide

Families of Graphs

A **parent graph** is a basic graph that is transformed to create other members in a family of graphs. The transformed graph may appear in a different location, but it will resemble the parent graph.

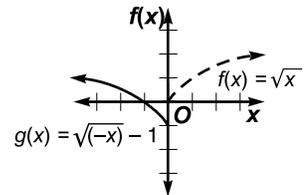
A **reflection** flips a graph over a line called the *axis of symmetry*.

A **translation** moves a graph vertically or horizontally.

A **dilation** expands or compresses a graph vertically or horizontally.

Example 1 Describe how the graphs of $f(x) = \sqrt{x}$ and $g(x) = \sqrt{-x} - 1$ are related.

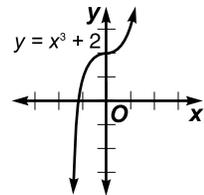
The graph of $g(x)$ is a reflection of the graph of $f(x)$ over the y -axis and then translated down 1 unit.



Example 2 Use the graph of the given parent function to sketch the graph of each related function.

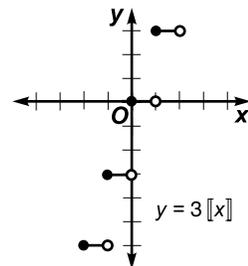
a. $f(x) = x^3$; $y = x^3 + 2$

When 2 is added to the parent function, the graph of the parent function moves up 2 units.



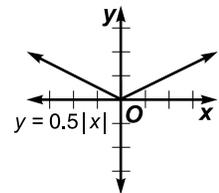
b. $f(x) = \llbracket x \rrbracket$; $y = 3\llbracket x \rrbracket$

The parent function is expanded vertically by a factor of 3, so the vertical distance between the steps is 3 units.



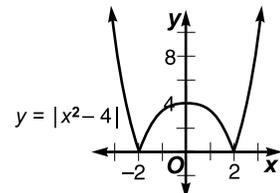
c. $f(x) = |x|$; $y = 0.5|x|$

When $|x|$ is multiplied by a constant greater than 0 but less than 1, the graph compresses vertically, in this case, by a factor of 0.5.



d. $f(x) = x^2$; $y = |x^2 - 4|$

The parent function is translated down 4 units and then any portion of the graph below the x -axis is reflected so that it is above the x -axis.



Practice

Families of Graphs

Describe how the graphs of $f(x)$ and $g(x)$ are related.

1. $f(x) = x^2$ and $g(x) = (x + 3)^2 - 1$ 2. $f(x) = |x|$ and $g(x) = -|2x|$

Use the graph of the given parent function to describe the graph of each related function.

3. $f(x) = x^3$
a. $y = 2x^3$

4. $f(x) = \sqrt{x}$
a. $y = \sqrt{x + 3} + 1$

b. $y = -0.5(x - 2)^3$

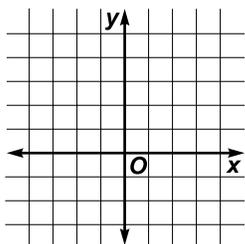
b. $y = \sqrt{-x} - 2$

c. $y = |(x + 1)^3|$

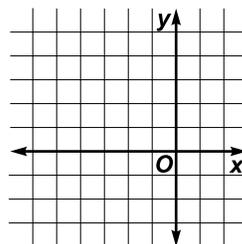
c. $y = \sqrt{0.25x} - 4$

Sketch the graph of each function.

5. $f(x) = -(x - 1)^2 + 1$



6. $f(x) = 2|x + 2| - 3$



7. **Consumer Costs** During her free time, Jill baby-sits the neighborhood children. She charges \$4.50 for each whole hour or any fraction of an hour. Write and graph a function that shows the cost of x hours of baby-sitting.

