ADDITIONAL EXAMPLES

8-7 Radical Functions

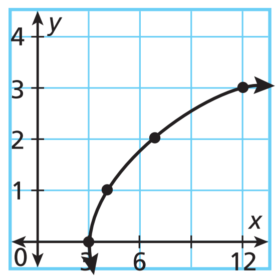
Example 1 Graphing Radical Functions

Graph each function and identify its domain and range.

A. $f(x) = \sqrt{x - 3}$

Make a table of values. Plot enough ordered pairs to see the shape of the curve. Because the square root of a negative number is imaginary, choose only nonnegative values for $x - 3$.

x	$f(x) = \sqrt{x - 3}$	$(x, f(x))$
3	$f(3) = \sqrt{3 - 3} = \sqrt{0} = 0$	(3, 0)
4	$f(4) = \sqrt{4 - 3} = \sqrt{1} = 1$	(4, 1)
7	$f(7) = \sqrt{7 - 3} = \sqrt{4} = 1$	(7, 2)
12	$f(12) = \sqrt{12 - 3} = \sqrt{9} = 3$	(12, 3)



The domain is $\{x \mid x \geq 3\}$, and the range is $\{y \mid y \geq 0\}$.

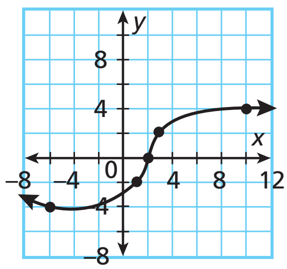
8-7 Radical Functions

Example 1 Graphing Radical Functions (continued)

B. $f(x) = 2\sqrt[3]{x - 2}$

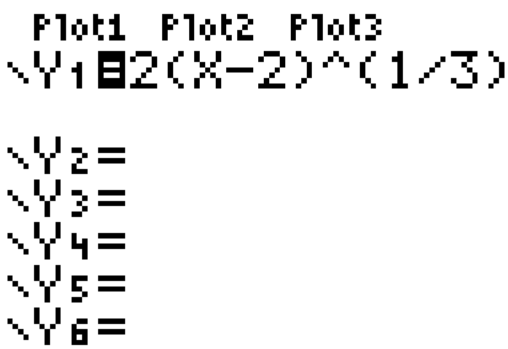
Make a table of values. Plot enough ordered pairs to see the shape of the curve. Choose both negative and positive values for *x*.

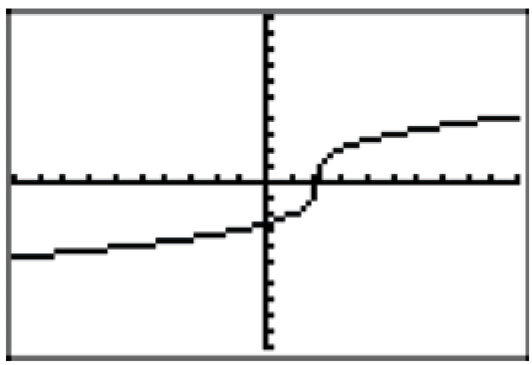
x	$f(x) = 2\sqrt[3]{x-2}$	$(x, f(x))$
-6	$f(-6) = 2\sqrt[3]{-6-2} = 2\sqrt[3]{-8} = -4$	$(-6, -4)$
1	$f(1) = 2\sqrt[3]{1-2} = 2\sqrt[3]{-1} = -2$	$(1, -2)$
2	$f(2) = 2\sqrt[3]{2-2} = 2\sqrt[3]{0} = 0$	$(2, 0)$
3	$f(3) = 2\sqrt[3]{3-2} = 2\sqrt[3]{1} = 2$	$(3, 2)$
10	$f(10) = 2\sqrt[3]{10-2} = 2\sqrt[3]{8} = 4$	$(10, 4)$



The domain is the set of all real numbers. The range is also the set of all real numbers.

Check Graph the function on a graphing calculator.





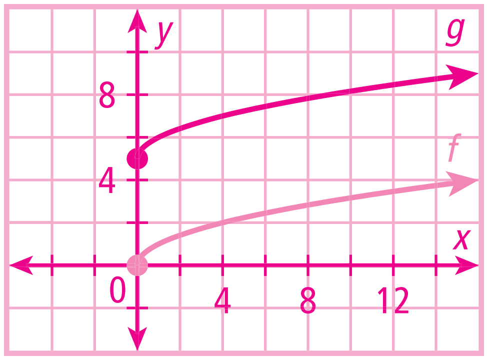
8-7 Radical Functions

Example 2 Transforming Square-Root Functions

Using the graph of $f(x) = \sqrt{x}$ as a guide, describe the transformation and graph the function $g(x) = \sqrt{x} + 5$.

$g(x) = f(x) + 5$

Translate f 5 units up.

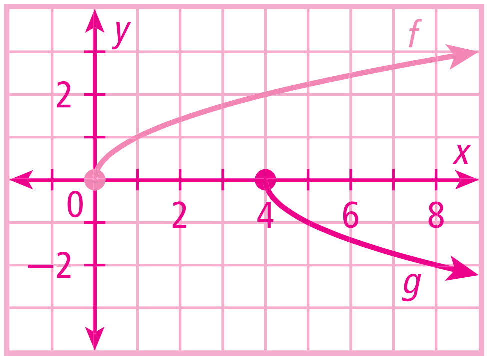


8-7 Radical Functions

Example 3 Applying Multiple Transformations

Using the graph of $f(x) = \sqrt{x}$ as a guide, describe the transformation and graph the function $g(x) = -\sqrt{x - 4}$.

Reflect *f* across the *x*-axis, and translate it 4 units to the right.



ADDITIONAL EXAMPLES

8-7 Radical Functions

Example 4 Writing Transformed Square-Root Functions

Use the description to write the square-root function *g*. The parent function $f(x) = \sqrt{x}$ is reflected across the *x*-axis, compressed vertically by a factor of $\frac{1}{5}$, and translated down 5 units.

Step 1 Identify how each transformation affects the function.

Reflection across the *x*-axis: *a* is negative
Vertical compression by *a* factor of $\frac{1}{5}$
} $a = -\frac{1}{5}$

Translation 5 units down: $k = -5$

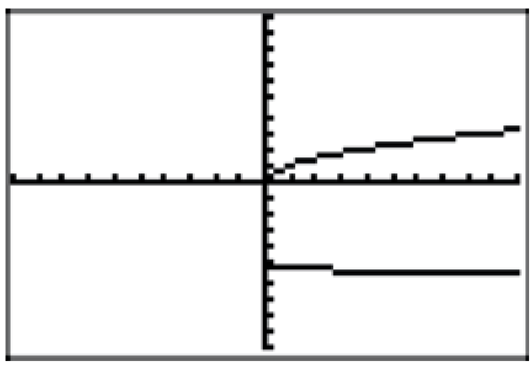
Step 2 Write the transformed function.

$g(x) = a\sqrt{x} + k$

$g(x) = \left(-\frac{1}{5}\right)\sqrt{x} + (-5)$ *Substitute $-\frac{1}{5}$ for a and -5 for h.*

$g(x) = -\frac{1}{5}\sqrt{x} - 5$ *Simplify.*

Check Graph both functions on a graphing calculator. The graph of *g* indicates the given transformations of *f*.



8-7 Radical Functions

Example 5 Business Application

A framing store uses the function $c(a) = 0.5\sqrt{a} + 0.2$ to determine the cost c in dollars of glass for a picture with an area a in square inches. The store charges an additional \$6.00 in labor to install the glass. Write the function d for the total cost of a piece of glass, including installation, and use it to estimate the total cost of glass for a picture with an area of 192 in^2.

Step 1 To increase c by 6.00, add 6 to *c*.

$d(a) = c(a) + 6 = 0.5\sqrt{a} + 6.2$

Step 2 Find the value of *d* for a picture with an area of 192 in^2.

$d(192) = 0.5\sqrt{192} + 6.2 \approx 13.13$ *Substitute 192 for a and simplify.*

The cost for the glass of a picture with an area of 192 in^2 is about \$13.13 including installation.

ADDITIONAL EXAMPLES

8-7 Radical Functions

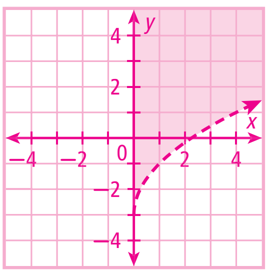
Example 6 Graphing Radical Inequalities

Graph the inequality $y > 2\sqrt{x} - 3$.

Step 1 Use the related equation $y = 2\sqrt{x} - 3$ to make a table of values.

x	0	1	4	9
y	−3	−1	1	3

Step 2 Use the table to graph the boundary curve. The inequality sign is $>$, so use a dashed curve and shade the area above it.



Because the value of x cannot be negative, do not shade left of the y-axis.

Check Choose a point in the solution region, such as $(1, 0)$, and test it in the inequality.

$y > 2\sqrt{x} - 3$

$0 > 2(1) - 3$

$0 > -1$ ✔