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Graphing Square Root Functions

Unit 10 Lesson 5

Graphing Square Root Functions

Students will be able to:

- Graph square root function.
- Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.
- Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Graphing Square Root Functions

Key Vocabulary:

Square Root Functions

Range

Domain

Transformation

Graphing Square Root Functions

A square root function is a function containing a square root with the independent variable in the radicand. The parent square root function is $y = \sqrt{x}$.

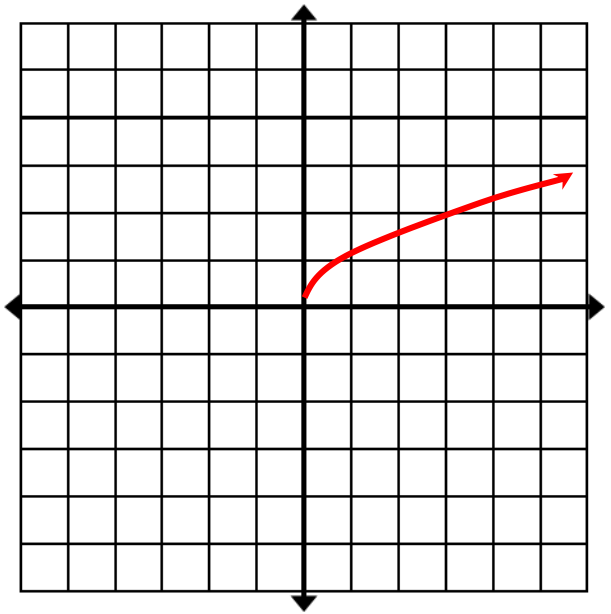
The domain of $y = \sqrt{x}$ is $x \geq 0$.

The range of $y = \sqrt{x}$ is $y \geq 0$.

Graphing Square Root Functions

The table and graph below show the parent square root function $y = \sqrt{x}$

x	y
0	0
1	1
2	1,41
4	2



Graphing Square Root Functions

Transformations

General Form of a Square Root Function is:

$$y = a\sqrt{x - h} + k$$

Graphing Square Root Functions

$\boldsymbol{a}$ - Represents vertical stretch or compression

$a < 0$ ------- reflection across the x-axis

$\boldsymbol{h}$ - Represents **Horizontal Translation**

- $(x - h)$: h units to the R
- $(x + h)$: h units to the L

$\boldsymbol{k}$ - Represents **Vertical Translation**

- $+k$: k units up
- $-k$: k units down

Graphing Square Root Functions

Graphing Procedure

- Identify the horizontal and vertical translations
- Apply the translations to the parent square root function's table
- Graph the coordinate points
- Identify the Domain & Range

Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$$y = \sqrt{x + 2}$$

Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$y = \sqrt{x+2}$ Horizontal Shift: Left 2 No Vertical Shift

Domain

$x + 2 \geq 0$

$x \geq -2$

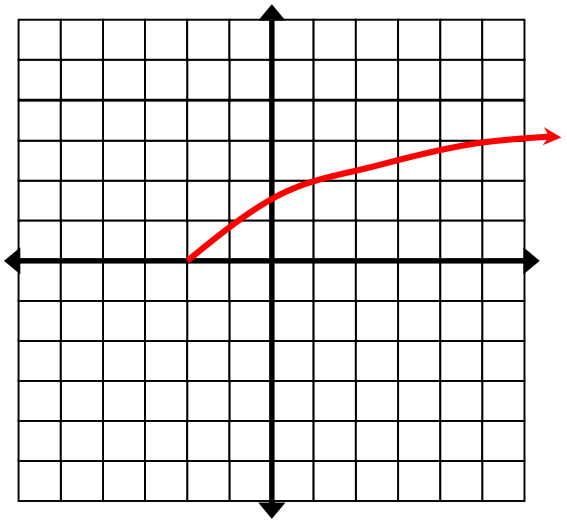
D:[-2,∞]

Range

$y \geq 0$

R :[0,∞]

x	y
-2	0
0	1,41
2	2
4	2,44
6	2,85



Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$\boldsymbol{b}.\ \boldsymbol{y} = \sqrt{\boldsymbol{x}} + 1$

Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$y = \sqrt{x} + 1$ No Horizontal Shift: Vertical Shift up 1

Domain

$x \geq 0$

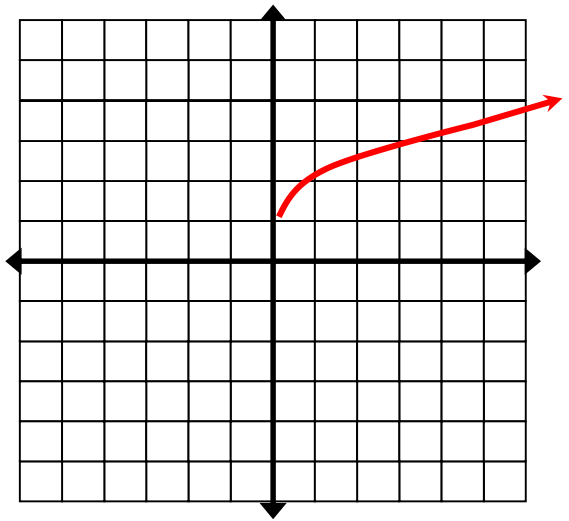
D:[0,∞]

Range

$y \geq 0$

R :[1,∞]

x	y
o	1
1	2
4	3
5	3,23
6	3,44



Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$\boldsymbol{b.}\ \boldsymbol{y = \sqrt{x + 4} + 1}$

Graphing Square Root Functions

Sample Problem 1: Graph function and identify its domain and range.

$\boldsymbol{b.}\ \boldsymbol{y = \sqrt{x+4}+1}$ Horizontal Shift: Left 4, Vertical Shift: Up 1

Domain

$x \geq -4$

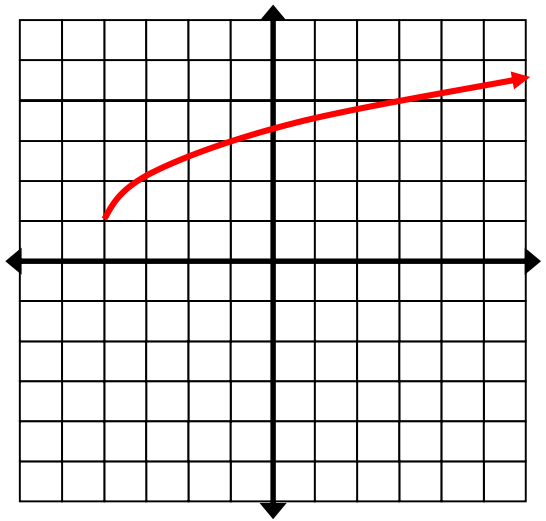
D:[-4,∞]

Range

$y \geq 1$

R :[1,∞]

x	y
-4	1
-3	2
0	3
5	4



Graphing Square Root Functions

Writing Transformed Square-Root Functions

Sample Problem 2: Use the description to write the square root function $g(x)$.

a. The parent function $f(x) = \sqrt{x}$ is reflected across the x-axis, and translated down 5 units.

Graphing Square Root Functions

Writing Transformed Square-Root Functions

Sample Problem 2: Use the description to write the square root function $g(x)$.

a. The parent function $f(x) = \sqrt{x}$ is reflected across the x-axis, and translated down 5 units.

$$g(x) = -\sqrt{x} - 5$$

Graphing Square Root Functions

Writing Transformed Square-Root Functions

Sample Problem 2: Use the description to write the square root function $g(x)$.

b. The parent function $f(x) = \sqrt{x}$ is translated up 5 units and 3 units left

Graphing Square Root Functions

Writing Transformed Square-Root Functions

Sample Problem 2: Use the description to write the square root function $g(x)$.

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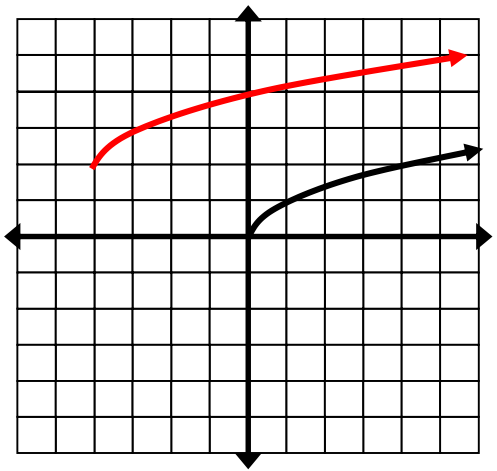
$$g(x) = \sqrt{x + 3} - 5$$

Graphing Square Root Functions

Applying Multiple Transformations

Sample Problem 3: Use the graph shown as a guide, write the equation and describe the transformation.

a.



Graphing Square Root Functions

Applying Multiple Transformations

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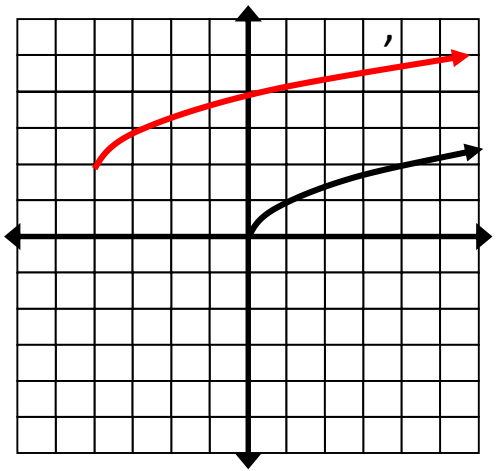


$$g(x) = \sqrt{x+4} + 2$$

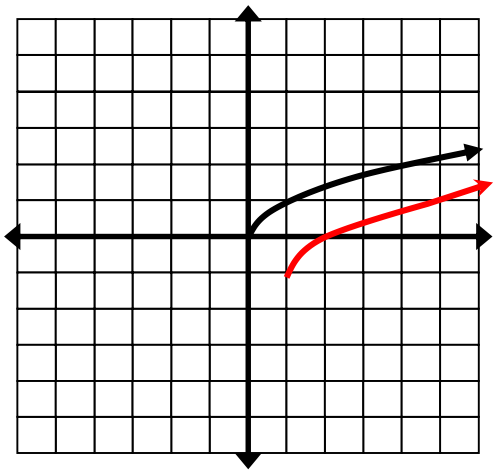
The parent function $f(x) = \sqrt{x}$ translates 4 units left and 2 units up

Graphing Square Root Functions

Applying Multiple Transformations

Sample Problem 3: Use the graph shown as a guide, write the equation and describe the transformation.

b.



Graphing Square Root Functions

Applying Multiple Transformations

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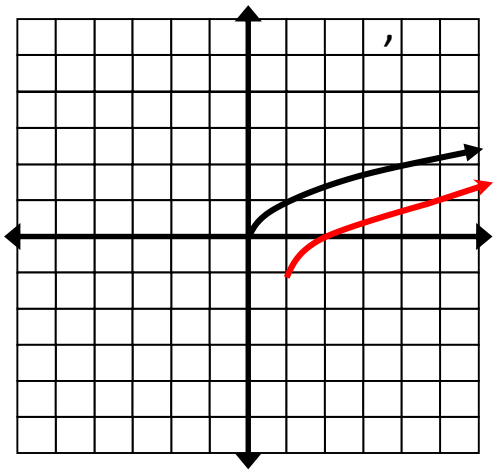

$$g(x) = \sqrt{x - 1} - 1$$

The parent function $f(x) = \sqrt{x}$
translates 1 unit right and 1 unit down