

Algebra II

Lesson 7-8: Graphing Square Root and Its relationship to the Quadratic Function

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Review: an equation is a function we can put in a value for x , the independent variable and get a unique output, y .

In an **inverse function** operations on the output are such that we arrive back at our original starting value of x . A function can be described as a "DO" and the inverse can be described as the "UNDO." Put another way, an inverse relation is an exact opposite of what a function does.

Inverse Function Notation

$$f^{-1}(x)$$

stated as "f inverse of x."

- Step 1 Switch the x and y
- Step 2 Solve for the new " y ", and replace y with $f^{-1}(x)$

Example: Find the inverse function for

$$y = x + 3$$

f^{-1}

$$x = y + 3$$

$$y = x - 3$$

$$f^{-1}(x) = x - 3$$

Step 1: switch x and y

solve

Step 2: replace y with $f^{-1}(x)$

Given: $f(x) = x^2$ find $f^{-1}(x)$

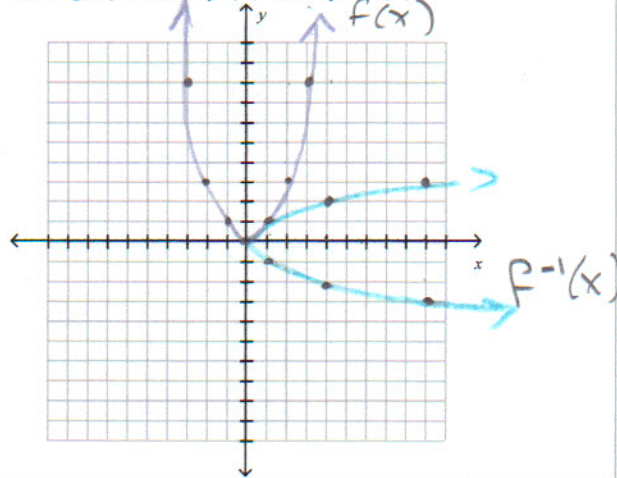
$$f(x): y = x^2 \quad \text{switch}$$

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

$$f^{-1}(x): y = \pm \sqrt{x} \quad \begin{matrix} y = \sqrt{x} \\ y = -\sqrt{x} \end{matrix}$$

x	y	x	y
0	0	9	3
1	1	9	-3
1	-1		
4	2		
4	-2		

Now graph both $f(x)$ and $f^{-1}(x)$



Identify the graphs.

What is the domain and range for each $f(x)$ and $f^{-1}(x)$?

$$f(x) \quad D = (-\infty, \infty) \\ R = [0, \infty)$$

$$f^{-1}(x) \quad D = [0, \infty) \\ R = (-\infty, \infty)$$

x & y switched,
 D & R switched

Which is a function which is not (look at vertical line test)?

$f(x)$ function

$f^{-1}(x)$ Not function

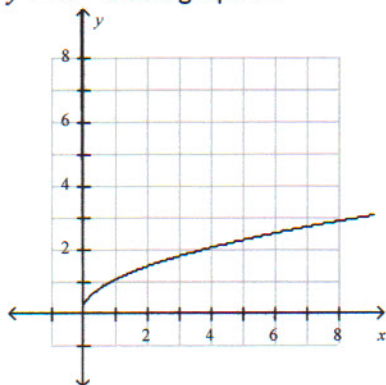
How can I restrict my domain/range on $f^{-1}(x)$ so to make it a function?

$$f^{-1}(x) \quad D [0, \infty)$$

$R: [0, \infty)$ Range only positive

Parent Function

The equation of the square root parent function is $y = \sqrt{x}$ with a graph of



Domain:

$$[0, \infty)$$

Range:

$$[0, \infty)$$

Transformations:

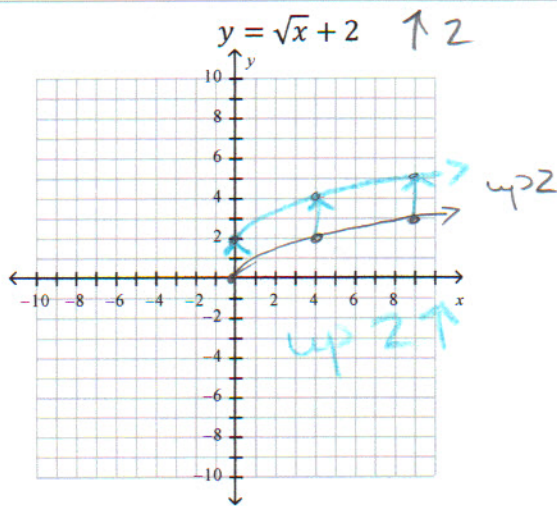
As with our absolute value functions and quadratic functions, when graphing radical functions we see translations and shifts within the radical family of functions.

Parent function:	$y = \sqrt{x}$	$y = \sqrt[n]{x}$
Reflection in x-axis	$y = -\sqrt{x}$	$y = -\sqrt[n]{x}$
Stretch $a > 1$ Shrink $0 < a < 1$	$y = a\sqrt{x}$	$y = a\sqrt[n]{x}$
Translation: Horizontal by h Vertical by k	$y = \sqrt{x-h}$ $y = \sqrt{x} + k$	$y = \sqrt[n]{x-h}$ $y = \sqrt[n]{x} + k$
Combined	$y = \sqrt{x-h} + k$	$y = \sqrt[n]{x-h} + k$

Graphing square root functions is handled in the same fashion that other functions are graphed. Care should be given to equation entry on the calculator. Understand that the calculator sees the equation in terms of order of operation. So an exponent of $\frac{1}{2}$ may be interpreted by a calculator as an exponent of 2 and all divided by 3. Compare the graphs of these two equations entered into the calculator as typed:

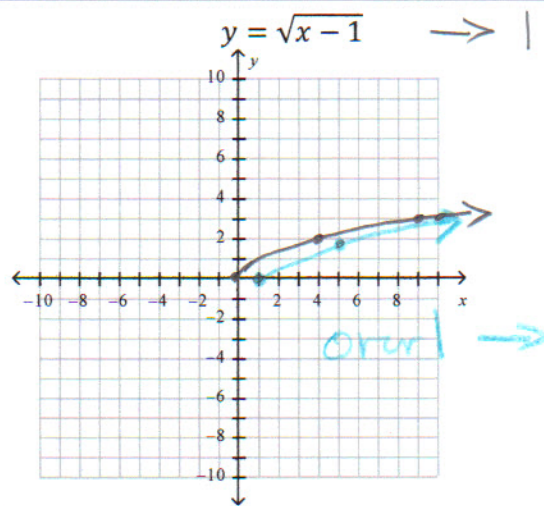
$2(x+3)^{1/2}$ vs. $2(x+3)^{(1/2)}$. While you want the exponent of $1/2$ the first entry is seen as $2(x+3)^1$ (a parabola) all divided by 2!

Using transformations, translate the square root functions and state the domain and range.



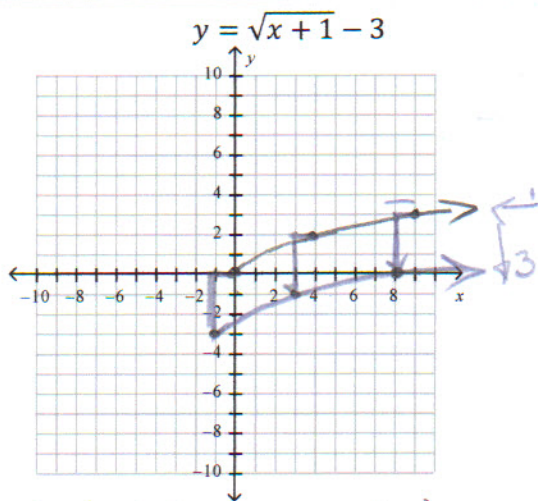
$$D: [0, \infty)$$

$$R: [2, \infty)$$



$$D: [1, \infty)$$

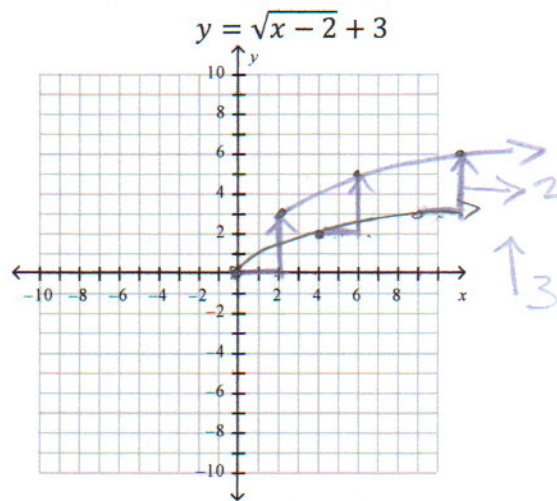
$$R: [0, \infty)$$



What happens first
left 1 then down 3

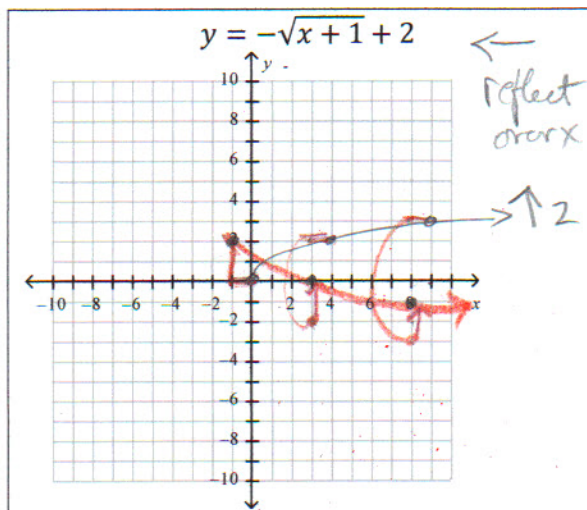
$$D: [-1, \infty)$$

$$R: [-3, \infty)$$



$$D: [2, \infty)$$

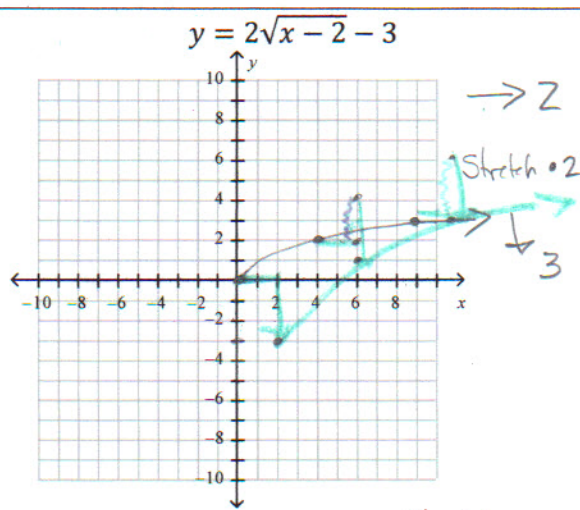
$$R: [3, \infty)$$



D: $[-1, \infty)$

R: $(-\infty, 2]$

x	y
-1	2
3	-2
8	-1



D: $[2, \infty)$

R: $[-3, \infty)$

Stretch move L/R
then take "y"
value multiply by st.
factor

x	y
2	-3
6	1
11	3

* Remember, you can use a table of values too!