$f(x)=2x-3$ $\quad f^{-1}(x)=\dfrac{x+3}{2}$

Composites of Inverses

For the above function and its inverse find each of the following:

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

$= 2\left(\dfrac{x+3}{2}\right)-3$

$= x+3-3$

$= x$

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

$= \dfrac{(2x-3)+3}{2}$

$= \dfrac{2x}{2} = x$

If $f(x)$ and $f^{-1}(x)$ are inverses, then

BOTH $f(f^{-1}(x)) = x$
and
$f^{-1}(f(x)) = x$

Are these functions inverses?

2. $f(x) = (x+5)^3 - 7$ $\quad g(x)= \sqrt[3]{x+7} - 5$

A. $f(g(x))=$

$\left(\left(\sqrt[3]{x+7}-5\right)+5\right)^3-7$

$\left(\sqrt[3]{x+7}\right)^3-7$

$x+7-7$

$= x$

B. $g(f(x))=$

$\sqrt[3]{(x+5)^3-7+7}-5$

$\sqrt[3]{(x+5)^3}-5$

$x+5-5$

$= x$

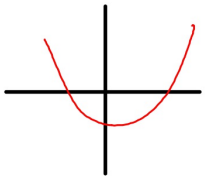
Since both composite result in x the two functions must be inverses

Squaring $( )^2$ and Square Root $\sqrt{\ }$ are inverses of each other.

The graph of an inverse relation is the reflection of the original graph over the line $y=x$.

What does the graph of $(\ )^2$ look like?

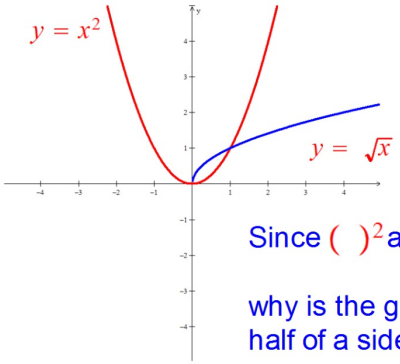
Parabola



Since $\sqrt{\ }$ is the inverse of $(\ )^2$ what would you expect the graph of $\sqrt{\ }$ to look like?

Sideways Parabola ?

Graph both $y = x^2$ and $y = \sqrt{x}$ in a Standard Window.



Since $(\ )^2$ and $\sqrt{\ }$ are inverses

why is the graph of $\sqrt{\ }$ only half of a sideways parabola.

$$y = \sqrt{x}$$

Why is the graph of the above only "half a sideways parabola"?

- If it were both halves then it wouldn't be a function.
- Without a sign in front of the radical it means the Principal Square Root (positive root).

$y = a(x - h)^2 + k$

Vertex:

h: Horizontal Translation

(h,k)

k: Vertical Translation

a: a>1 Vertical Stretch
0<a<1 Vertical Shrink
a is neg: x-axis reflection (upside down)

Describe the transformations to the parent function the following equation represents.

$y = -3(x + 1)^2 - 8$

- x-axis reflection (upside down)
- Vertical Stretch Factor of 3 (3 times taller)
- Shift 1 unit left
- Shift 8 units down

$y = 8(x - 9)^2 - 4$

State the Vertex of this parabola.

9 RT 4 down (9, -4)

Graph this parabola:

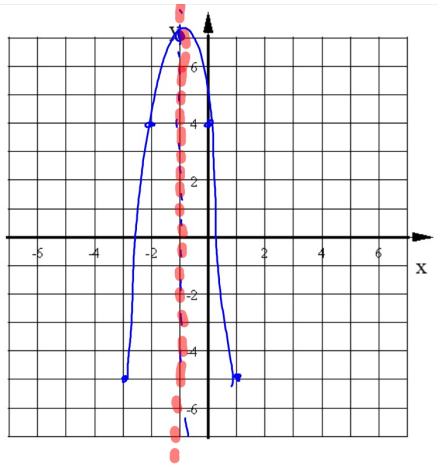
opens down

$y = -3(x+1)^2 + 7$

1 left 7 up

Vertex (-1, 7)

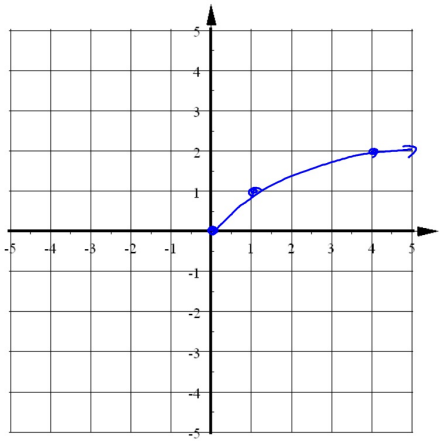
3x as tall

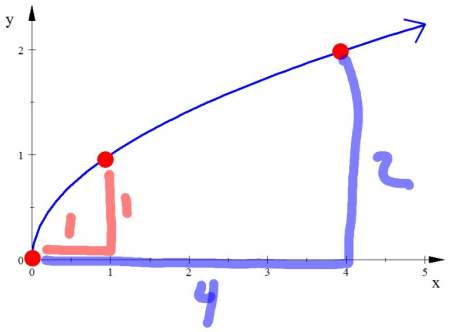


Graph of the Parent Function:

$y = \sqrt{x}$

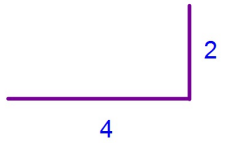
x	y
0	0
1	1
4	2
9	3





First "Good Point"

Second "Good Point"



What do you think $y = \sqrt{x-3}$ looks like?

The parent function shifted 3 units right

What do you think $y = \sqrt{x} + 7$ looks like?

The parent function shifted 7 units up

What do you think $y = -\sqrt{x}$ looks like?

The parent function upside down

What do you think $y = 3\sqrt{x}$ looks like?

The parent function 3 times taller

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

h: Horizontal Translation

k: Vertical Translation

a: a>1 Vertical Stretch

0<a<1 Vertical Shrink

a is neg: x-axis reflection (upside down)

The "vertex"

(h,k)

The new starting point
or
The new origin