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Do the 5.1 checkpoint on the brown table.

May 25-7:38 AM

One-to-one function

Inverse

Algebra 2 Section 5-2

Inverses of Quadratic Functions

Every  $x$  has a  $y$

$x=2$   $y=4$   
 $x=-2$   $y=4$

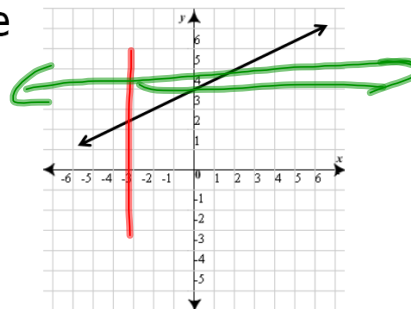
## One-to-One Functions

- Remember a Function cannot repeat any x values, so the graph cannot be touched twice by a vertical line
- A One-to-One Function cannot repeat any x or y values, so the graph cannot be touched twice by a vertical line or a horizontal line
- The inverse of a One-to-One function is also a function

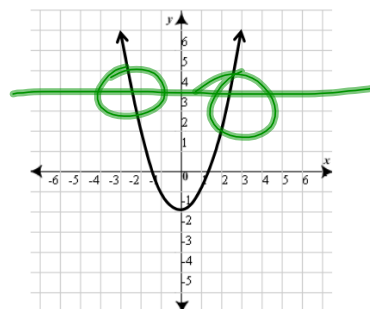
Linear functions are one-to-one functions

\*All but one...

$$y = 5$$

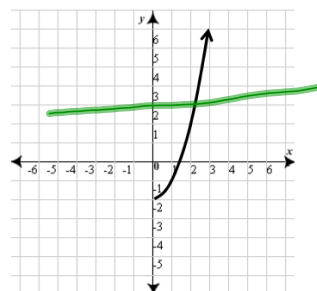


Quadratic functions are not one-to-one functions because some of the y values are used twice



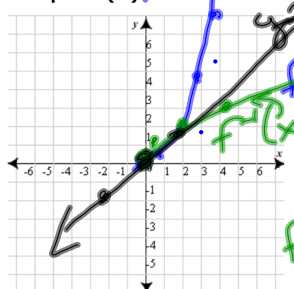
## Making a Quadratic Function One-to-One

- A Quadratic function could become a one-to-one function if you only used half of it
- If you restrict the domain of a quadratic function you can get half a parabola
- You need to restrict the domain at the x-value of the vertex
- Same graph as before, with  $x \geq 0$
- Now the graph shows a one-to-one function



Graph  $f(x) = 0.5x^2$  with  $x \geq 0$

$$f(x) = \frac{1}{2}x^2$$



x	0	1	2	3	4
y	0	$\frac{1}{2}$	2	4.5	8

Fill in inverse coordinates

$f^{-1}(x)$	x	0	$\frac{1}{2}$	2	4.5	8
	y	0	1	2	3	4

Graph the inverse relation on the same graph

Now draw in the line  $y = x$  and notice the reflection

Find the rule for  $f^{-1}(x)$

$$2 \cdot x = \left(\frac{1}{2} y^2\right) 2$$

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

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

$$f^{-1}(x) = \sqrt{2x}$$

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

Square Root Functions

- As you discovered on the last problem, the inverse of a quadratic function with a restricted domain is a square root function.
- Square root functions are only defined for values of  $x$  that make the expression under the radical sign nonnegative positive.
- We often write the inverse of function  $f$  using the notation  $f^{-1}$ .

①  $f(x) = -\frac{1}{4} \cdot x^2$

$$-4x = \left(-\frac{1}{4}y^2\right) - 4$$

$$\sqrt{-4x} = \sqrt{y^2}$$

$$y = \sqrt{-4x}$$

$$g(x) = \sqrt{-4x}$$
  

$f(x) = \sqrt{3x}$

$$x = (\sqrt{3y})^2$$

$$x^2 = 3y$$

$$\frac{x^2}{3} = \frac{3y}{3}$$

$$y = \frac{x^2}{3}$$

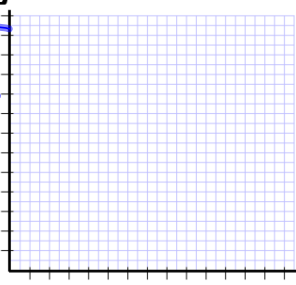
$$f^{-1}(x) = \frac{x^2}{3}$$

**Falling Penny**

The function  $d(t) = -16t^2$  gives the distance  $d$  in feet that a dropped object falls  $t$  seconds.

Write and graph the inverse function  $t(d)$  to find the time  $t$  in seconds it takes for an object to fall a distance of  $d$  feet.

$$d = -16t^2 \quad t = \sqrt{\frac{-d}{-16}}$$

$$\sqrt{\frac{d}{-16}} = \sqrt{t^2}$$


- Use the inverse function to find the time it will take a penny dropped into a well to fall 48 feet.

$$t = \sqrt{\frac{-(-48)}{16}} = \sqrt{\frac{48}{16}} = \sqrt{3} \approx 1.7 \text{ Sec}$$

**GUIDED PRACTICE**

Find the inverse of the given function. Then verify or check that your result and the original function are inverses.

1.  $f(x) = 3x^2$

Pg. 181-182  
pick  
6

2.  $f(x) = \frac{1}{4}x^2$