Inverse Relations

On a calculator, graph $y_1 = x^2$ and $y_2 = \sqrt{x}$. Fill in the following tables.

$y_1 = x^2$

x	y
.5	
1	
2	
3	
4	

$y_2 = \sqrt{x}$

x	y
.25	
1	
4	
9	
16	

What do you notice about the tables?

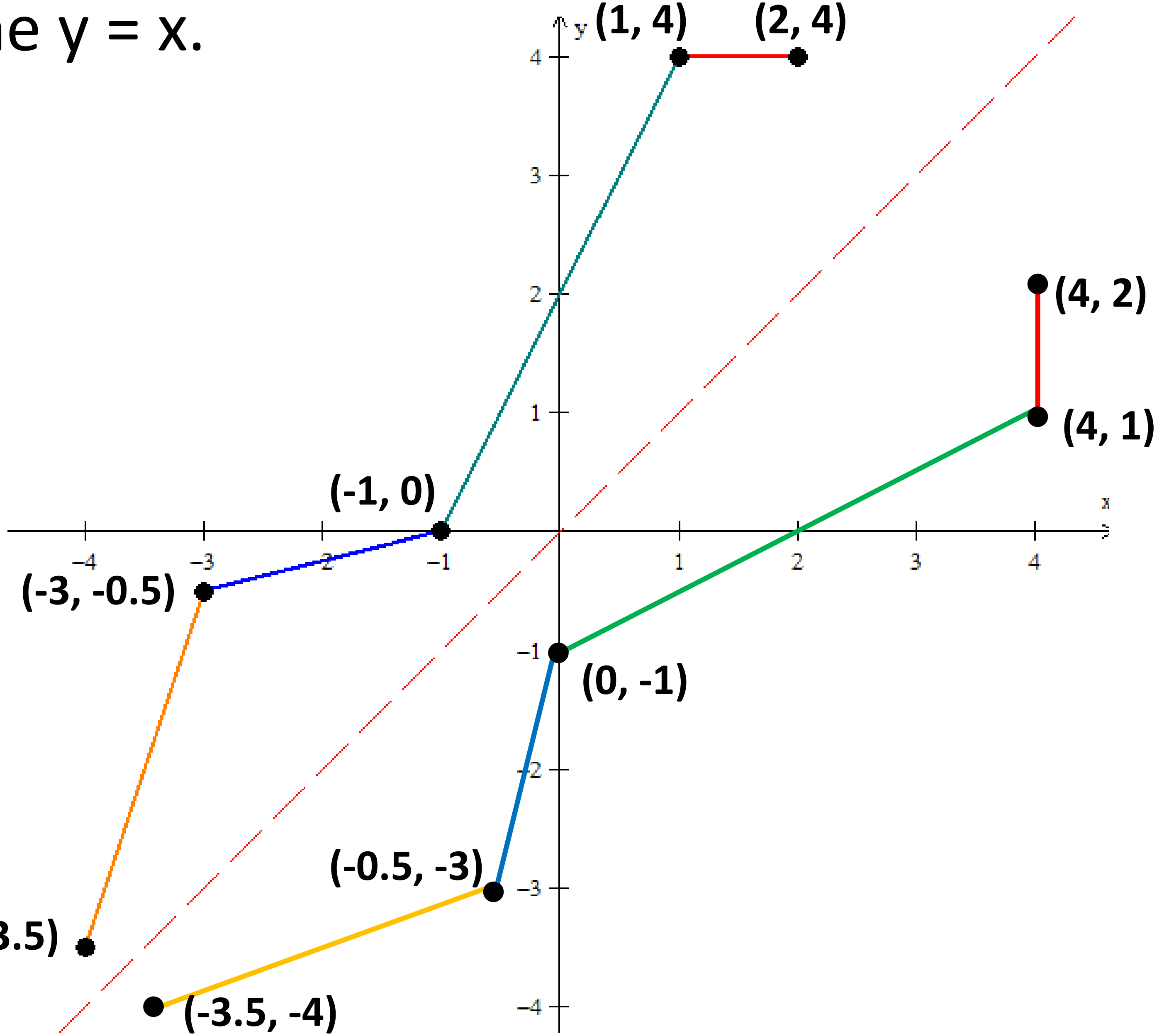
The **inverse** of a function is the reverse of the original function.

Inverses involve opposite operations.

The inverse of a function is written with a “-1.”

Function	**Inverse**
$f(x)$	$f^{-1}(x)$
$g(x)$	$g^{-1}(x)$

The graph of an inverse function is a reflection over the line y = x.



This means the x and y values are reversed for the inverse function.

Example) Fill in the table for $h^{-1}(x)$

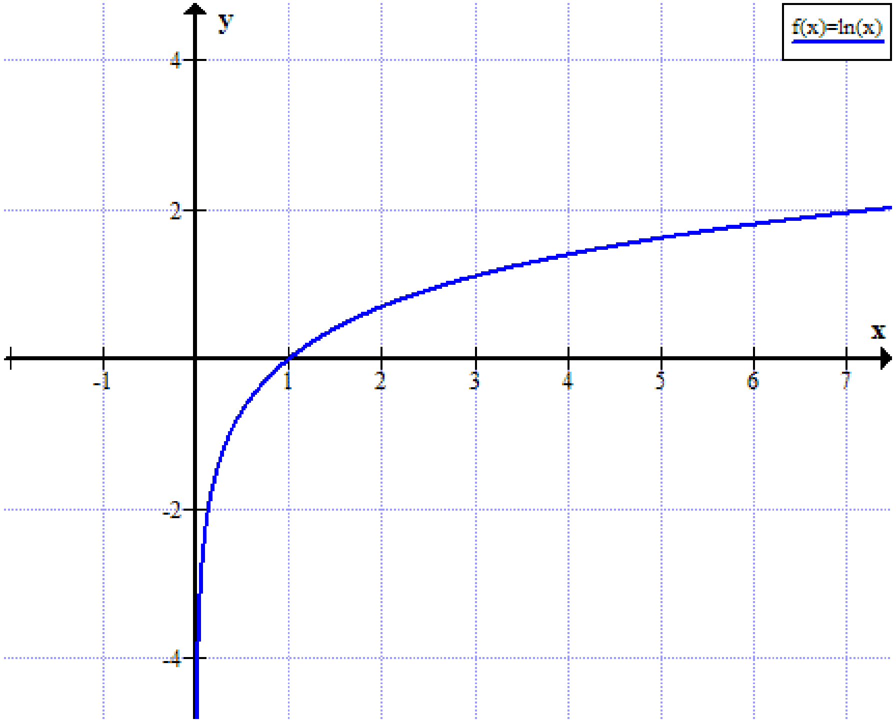
x	h(x)
1	-1
3	0
4	4
7	5
9	10
10	12

x	$h^{-1}(x)$
-1	1
0	3
4	4
5	7
10	9
12	10

Because the x and y values are switched, so are the domains and ranges.

Domain of f(x) = Range of $f^{-1}(x)$

Range of f(x) = Domain of $f^{-1}(x)$



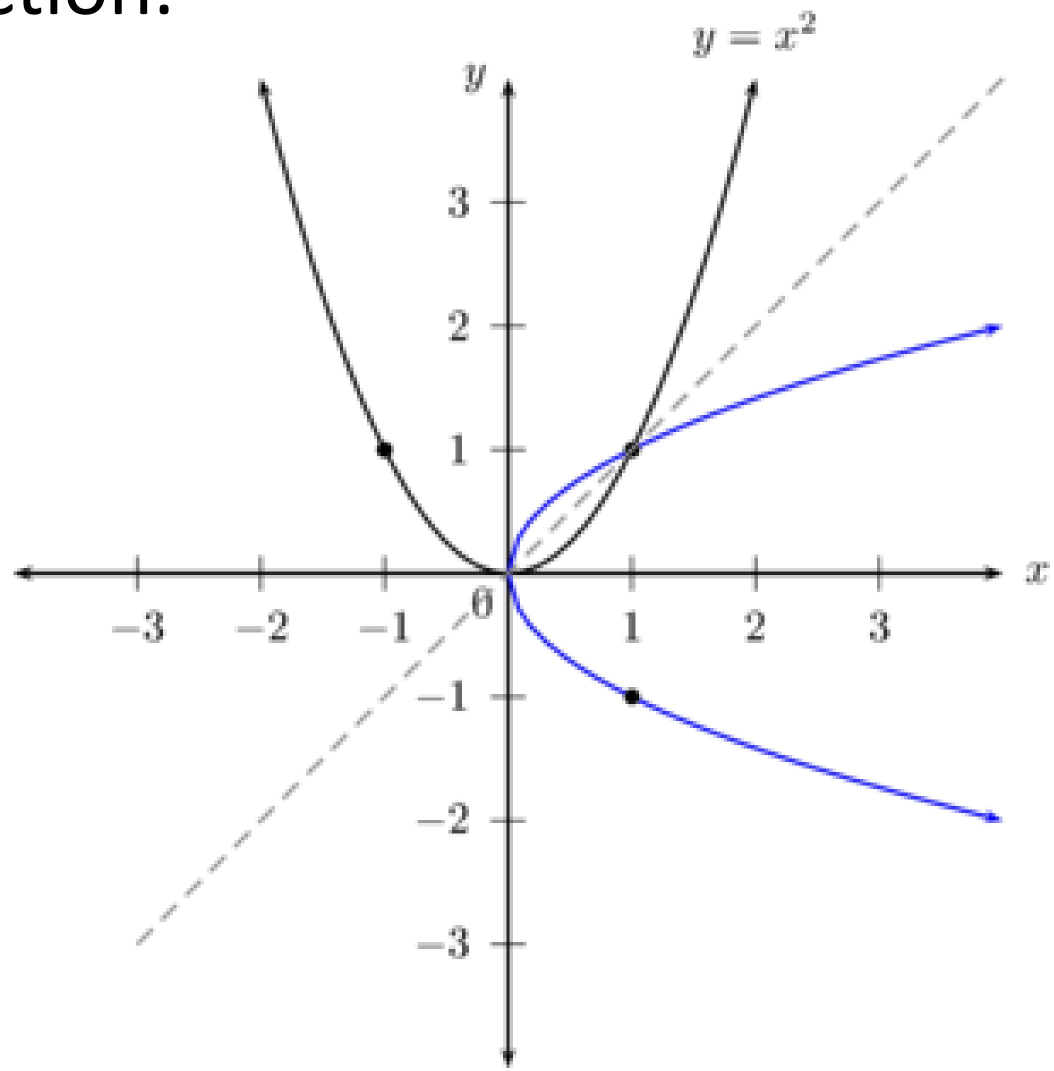
f(x)

Domain: $(0, \infty)$ Range: $(-\infty, \infty)$

$f^{-1}(x)$

Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

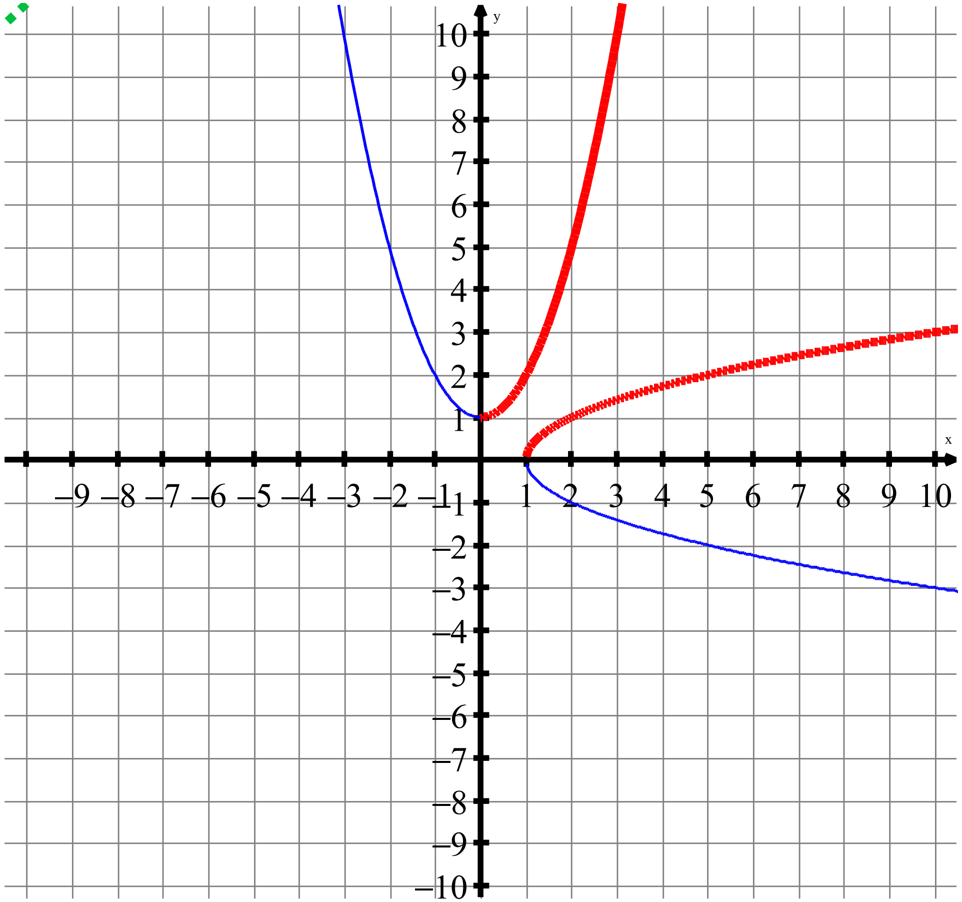
If a graph fails the **horizontal line test**, then you have to **restrict the domain** to make its inverse be a function.



If you restrict the domain to [0, ∞), then the inverse is a function.

f(x)

Domain: [0 , ∞) Range: [1 , ∞)



$f^{-1}(x)$

Domain: [1, ∞) Range: [0 , ∞)