Inverse Functions

(2.7)


CAN I WATCH THE MOVIE "KILLER PROM QUEEN" ON TV?
NO.
DO I HAVE TO EAT THIS SLIMY ASPARAGUS?
YES.
CAN I STAY UP TILL MIDNIGHT?
NO.
THERE'S AN INVERSE RELATIONSHIP BETWEEN HOW GOOD SOMETHING IS FOR YOU, AND HOW MUCH FUN IT IS.
WATTERSON

Notes 2-7 The Inverse Function

- Denoted as: $f(x) \Rightarrow f^{-1}(x)$

Ex 1 If $f(x) = 2x$ Then $f^{-1}(x) = \frac{x}{2}$

Show x and y tables

x	f(x)
12	24
24	48
6	12
36	72

x	$f^{-1}(x)$
24	12
48	24
12	6
72	36

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

Let f and g be two functions

- $f(g(x)) = x$ for every x in the domain of g
- $g(f(x)) = x$ for every x in the domain of f

then g is the inverse of f.

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

- An **inverse relation** maps the output values back to their original input values.

- The graph of an inverse relation is the reflection of the graph of the original relation.

- You can always find the inverse of a function by switching x and y.

Verify the following are inverse functions of each other.

$f(x) = 4x \qquad f^{-1}(x) = \frac{x}{4}$

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

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

Finding an inverse algebraically

1. Replace $f(x)$ with y.
2. Interchange the roles of x and y.
3. Solve this new equation for y.
4. Now $y = f^{-1}(x)$.

* This is not a way to prove two functions are inverses!

Find the inverse of f(x)= 2x-3

① $y = 2x - 3$

② $x = 2y - 3$

③ $\frac{x+3}{2} = y$

④ $f^{-1}(x) = \frac{1}{2}x + \frac{3}{2}$

Find the inverse of:

$$f(x) = x^2$$

$$y = x^2$$

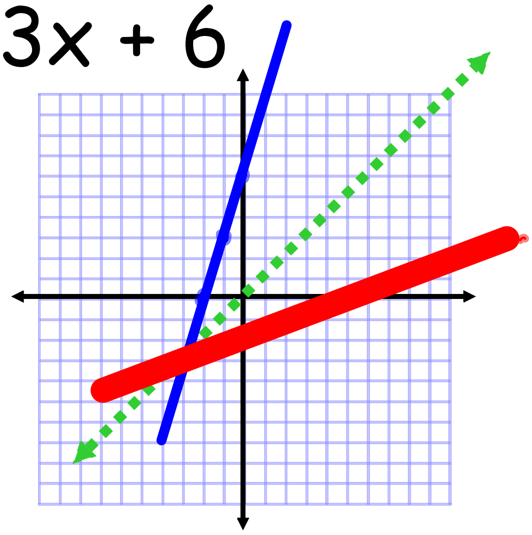
$$x = y^2$$

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

Graphing Inverse functions:

graph: $f(x) = 3x + 6$

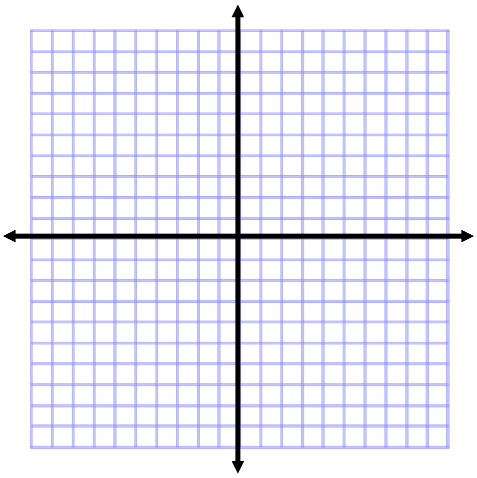
x	$f(x)$
3	15
6	24
0	6
-2	0
9	



x	$f^{-1}(x)$
15	3
24	4
6	0
0	-2

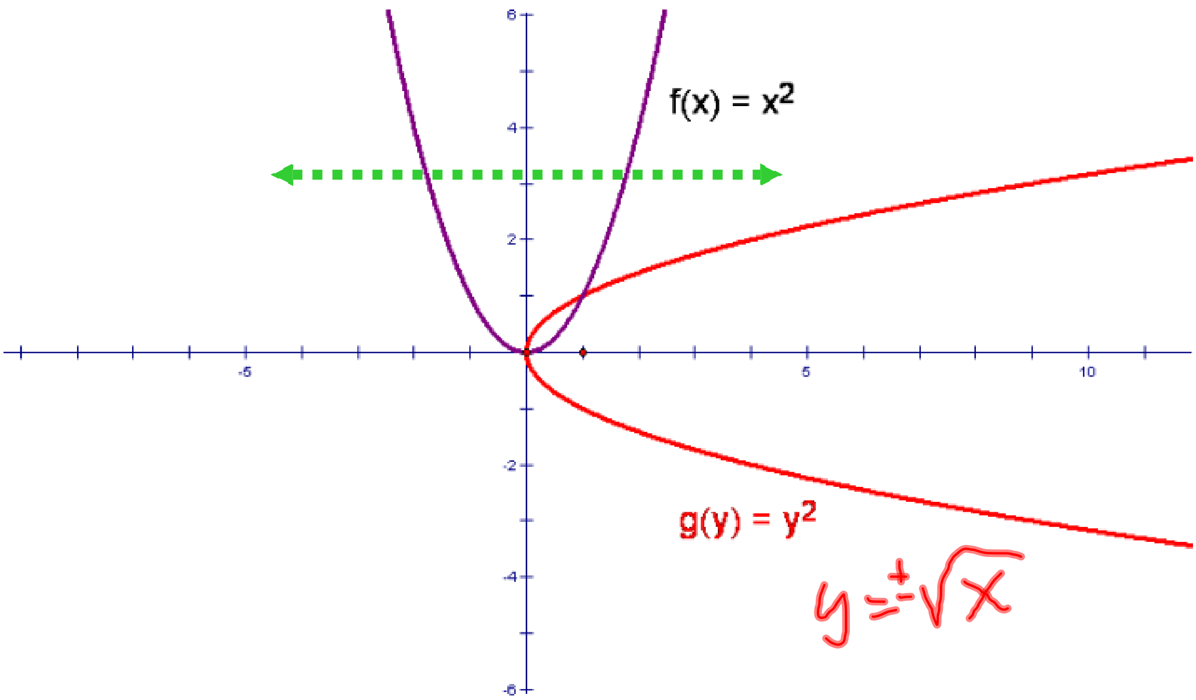
If point (a,b) lies on the graph of f, then the point (b,a) must lie on the graph of f^{-1}, and vice versa.

Graph $f(x) = 1 - x^3$ and its inverse.

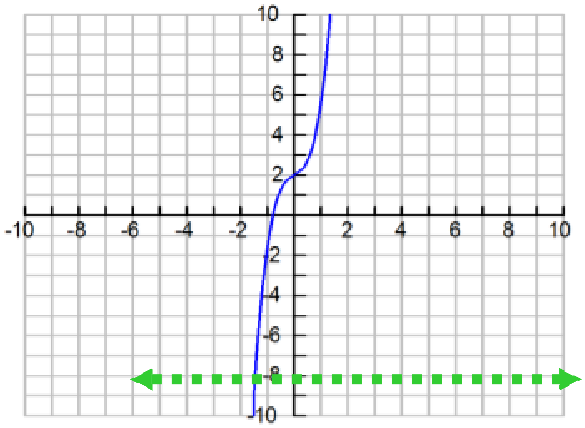


Horizontal Line Test

- If no horizontal line intersects the graph of a function more than once, then the inverse of the function is itself a function.



6
4
2
-2
-4
-6
-5
5
10
f(x) = x2
g(y) = y2
y = ±√x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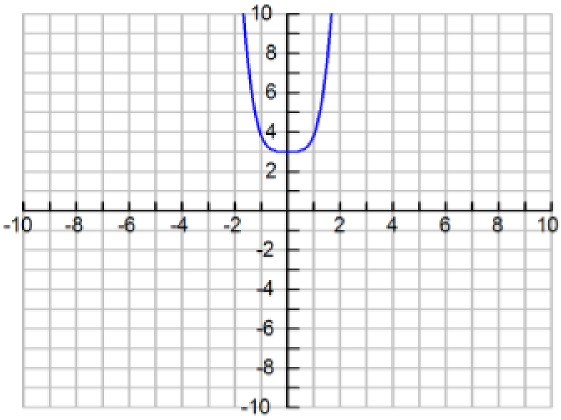

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HW:
Pg 248 #9-12, 14-24 evens, 25, 40, 42, 62