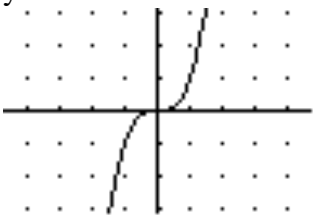
Algebra 2
157

Inverse Functions:

A function is one-to-one if it never repeats a y-value.

$y = x^2$ is not one-to-one because, for example, it contains the point (2, 4) and (-2, 4). In this example, the y-value of 4 occurs twice.

$y = x^3$ is one-to-one because each y-value occurs exactly once. The graph below can illustrate this.



if $f(x)$ and $g(x)$ are inverses of each other, their graphs are reflections of each other through the line y = x. This also means that if $f(a) = b$, then $g(b) = a$. What one function does, the inverse function un-does. Another way to put it is that the ordered pair of one is the reverse of the ordered pair of the other. For example if function $g$ contains the ordered pair, (3,-7), then function $g$ contains the ordered pair (-7, 3).

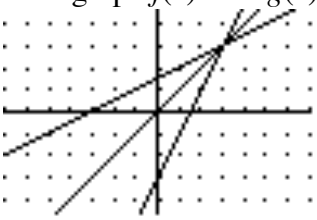
To find the equation representing the inverse of another, replace all x's with y and replace all y's with x, then solve for the new y.

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

*Solution*:

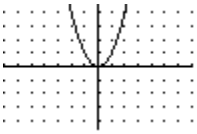
| | |
|---|---|
| $y = 2y - 3$ | Rewrite the function, using x and y |
| $x = 2y - 3$ | Replace all x's with y and replace all y's with x |
| $2y = x + 3$ | Add 3 to both sides |
| $y = \frac{x+3}{2}$ | Divide both sides by 2 |
| $\boxed{g(x) = \frac{x+3}{2}}$ | This is the inverse of the function $f(x) = 2x - 3$ |

Let's graph $f(x)$ and $g(x)$ on the same axes. We will also graph $y = x$ to observe the reflection across it.



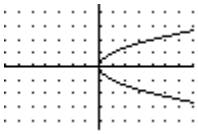
A **Boolean Statement** is either True or False. For computers and calculators, true = 1, and false = 0.
(5 > 3) = 1, because it is true. (5 < 3) = 0 because it is false.
In order for a function, $f$, to have an inverse, $g$, that is also a function, $f$ must be one-to-one. $y = x^2$ is not one-to-one, and you can draw a horizontal line that intersects the graph in more than one place. If we were to create another relation, $y = \pm\sqrt{x}$, it would not be a function because it would fail the vertical-line-test.

$y = x^2$



not a one-to-one function

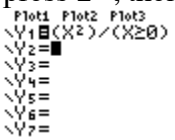
$y = \pm\sqrt{x}$ or $x = y^2$



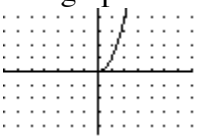
not a function

If we only consider the half of the above parabola where x is not negative, we would have a one-to-one function, and therefore we can find the inverse function.

How do we graph just part of a parabola with our calculator? We use a Boolean expression that will divide the function by zero if false and divide the function by 1 if true. To make the "is greater than or equal to" sign, press $2^{nd}$, then math (test) on the calculator.




The graph will appear as follows.



Algebra 2 Assignment 157 Thursday January 14 2016 Hour Name

For #'s 1-5, $f(x)$ and $g(x)$ are inverses. Find the equation of g(x), then find g(-3).

1. f (x) = 3x + 5.

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

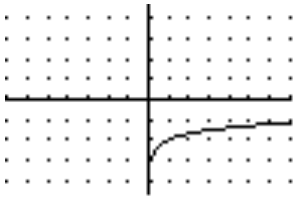
3. f (x) = $-\frac{2}{3}x + 1$.

4. f (x) = $3x^3$.

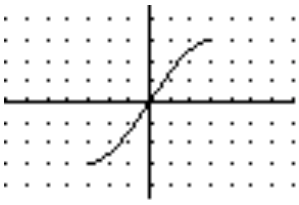
5. f (x) = $(x - 5)^3 - 1$.

For #'s 6-8, Graph the inverse on the same plane as the given function.

6.



7.



8.