Inverse Functions

Warm-up

Given $f(x) = 2x + 3$ and $g(x) = \frac{1}{2}(x - 3)$

    a) Find $f \circ g$ b) Find $g \circ f$

Definition of an Inverse Function

    Informal Definition: _____

    Formal Definition: a) $f(f^{-1}(x)) = $ _____

                              b) $f^{-1}(f(x)) = $ _____

Finding Inverse Functions Informally

1. Given $f(x) = 4x$

    a) Fill in the following table of values:

x	-4	-2	0	4	8
$f(x)$					

    b) Find the inverse of $f(x)$ informally.

    c) Fill in the following table of values for the inverse of $f(x)$.

x	-16	-8	0	16	32
$f^{-1}(x)$					

    d) Compare the rows in part (a) to the rows in part (c).

    e) Confirm that they are inverses by using the formal definition of an inverse.

Inverse Functions

Example 1

Verify that the functions are inverses of each other:

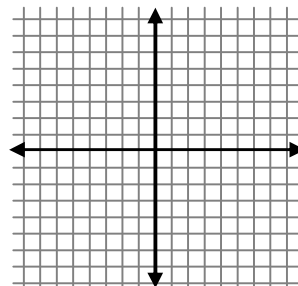$$f(x) = 2x^3 - 1 \qquad\qquad g(x) = \sqrt[3]{\dfrac{x+1}{2}}$$

Graphs of Inverse Functions

1. If $(3, 4)$ is a point on a function, name a point on its inverse: _____

2. If (a, b) is a point on a function, name a point on its inverse: _____

3. The graph of f^{-1} is a reflection of the graph of f over the line: _____

Example 2

a) Graph the line $y = x$.

b) Fill out the table below and sketch the graph of $f(x) = (x-3)^3 + 1$

x	1	3	4	5
$f(x)$				

c) Fill out the table below and sketch the graph of $f^{-1}(x)$.

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

Inverse Functions

Steps for Finding the Inverse of a Function

1. _____

2. _____

3. _____

4. _____

Example 3

Find the inverse function of $f(x) = \dfrac{5 - 3x}{2}$

Practice Problem 1

Find the inverse function of $f(x) = x^3 - 4$

Practice Problem 2

Find the inverse function of $f(x) = \sqrt{2x - 3}$