

Inverse Functions Video Lecture

Section 12.2

Course Learning Objective:

Demonstrate appropriate manipulation of function notation and be able to find the domain, range, and inverse of a function.

Weekly Learning Objectives:

- 1) Determine whether a function is a one-to-one function.**
- 2) Use the horizontal line test to decide whether a function is a one-to-one function.**
- 3) Find the inverse of a function.**
- 4) Find the equation of the inverse of a function.**
- 5) Graph functions and their inverses.**

Inverse Functions

$$\text{Let } f(x) = \{(-2, 1), (5, 4), (3, 1), (6, 2)\}$$

The inverse relation will be:

In order for a relation to be a function, each x-value can only be used once.

The graph of a function must pass the Vertical Line Test.

Vertical Line Test: If every vertical line intersects the graph at most once, then the graph is the graph of a function.

In order for a function to have an inverse function, each y-value can only be used once.

The graph of a function will have an inverse if it passes the Horizontal Line Test.

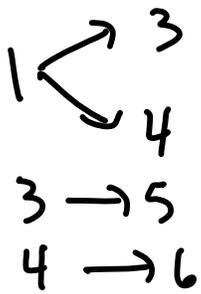
Horizontal Line Test: If every horizontal line intersects the graph of a function at most once, then the function has an inverse and is one-to-one.

One-to-One: For every x-value, there is one and only one y-value. If a function is one-to-one, then it has an inverse function.

Are the following relations one-to-one?

$$\begin{array}{l} 1 \rightarrow 5 \\ 2 \rightarrow 6 \\ 3 \rightarrow 4 \\ 4 \rightarrow 3 \end{array}$$

$$\begin{array}{l} 1 \rightarrow 5 \\ 2 \rightarrow 6 \\ 3 \rightarrow 4 \\ 4 \rightarrow 4 \end{array}$$

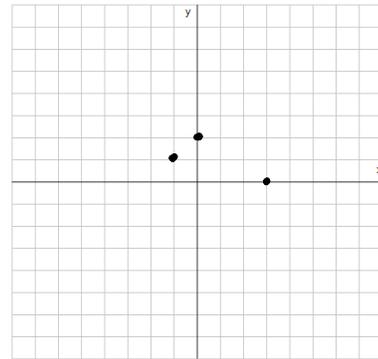


$$f(x) = x^2 + 2$$

Verify that the function is 1-1 and find its inverse:

$$f: \{(1, 3), (2, 4), (0, -3)\}$$

g:



How to determine the inverse function of $f(x)$:

- 1) Verify that $f(x)$ is 1-1
- 2) Change $f(x)$ to y
- 3) Swap x and y
- 4) Solve for y in terms of x
- 5) Change y to

Find the inverse of the functions:

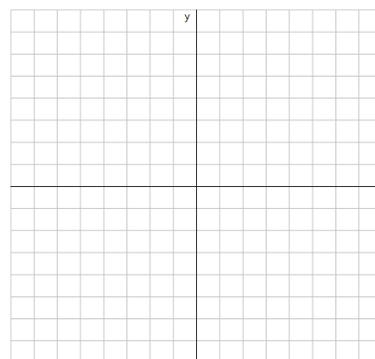
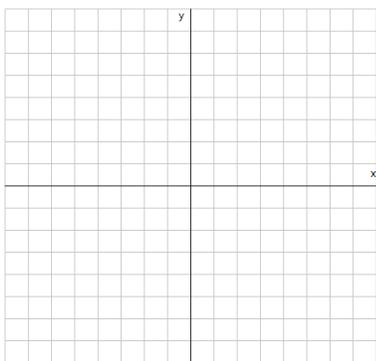
$$f(x) = 2x + 1$$

$$f(x) = 2x^3 - 3$$

Graph $f(x)$ and its inverse on the same set of axes.

$$f(x) = 2x - 3$$

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



If $f(3) = 6$, what is $f^{-1}(6)$?

Considering the function graphed below, find $f^{-1}(4)$.

