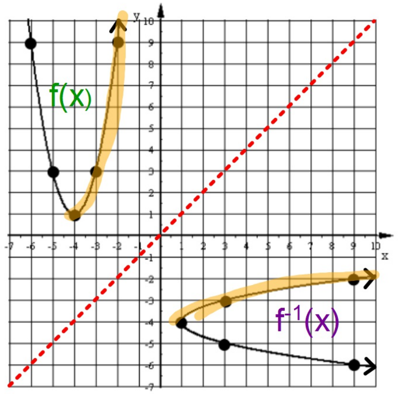
To make $f^{-1}(x)$ a function we must "cut off " part of $f(x)$.



If we cut off the left side of f(x) what does $f^{-1}(x)$ look like?

It looks like the top half of a sideways parabola.

What is the domain and range of this new f(x)?

Domain: $x \geq -4$

Range: $y \geq 1$

What is the domain and range of this new $f^{-1}(x)$?

Domain: $x \geq 1$

Range: $y \geq -4$

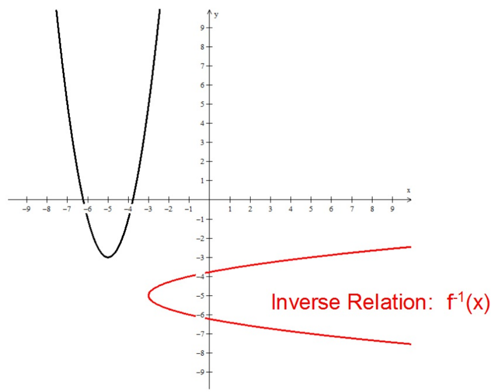
Is the inverse relation to

$Y_1 = 2(x+5)^2 - 3$

a function?

No, the inverse relation doesn't pass the Vertical Line Test.

Original Function: f(x)



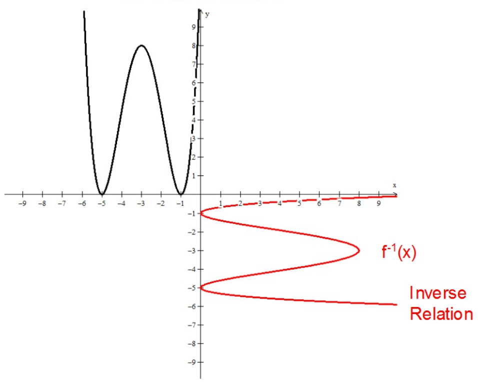
Is the inverse relation to

$Y = 0.5(X+5)^2(X+1)^2$

a function?

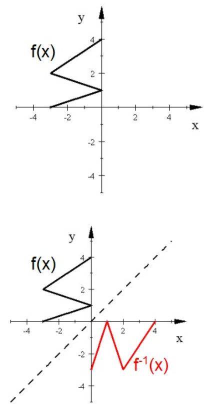
No, the inverse is not a function because it doesn't pass the Vertical Line Test.

f(x) Original Function



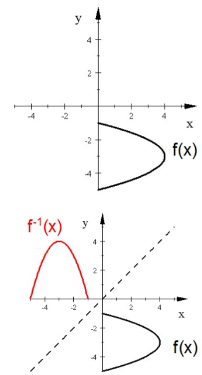
Given the original relation f(x) will the inverse relation $f^{-1}(x)$ be a function?

A



$f^{-1}(x)$ is a function

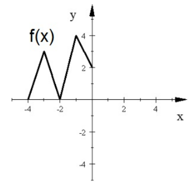
B

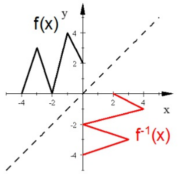


$f^{-1}(x)$ is a function

Given the original relation f(x) will the inverse relation $f^{-1}(x)$ be a function?

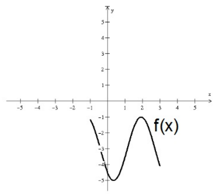
C

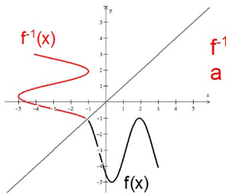




$f^{-1}(x)$ is NOT a function

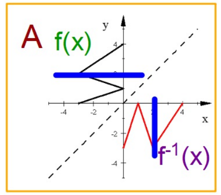
D

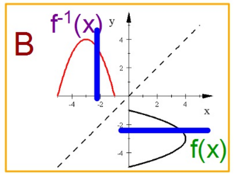




$f^{-1}(x)$ is NOT a function

Inverse IS a function



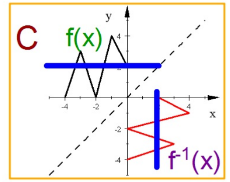


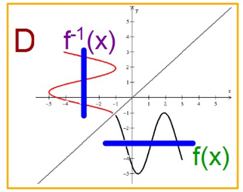
Given the graph of an orginal relation, how do you tell if the inverse relation is a function without actually graphing the inverse?

Draw Horizontal Lines on the original relation.

When a Horizontal Line on the original is reflected over y=x it becomes a Vertical Line on the inverse.

Inverse is NOT a function





<u>Horizontal Line Test</u>: a visual test to determine if the inverse relation will be a function.

If any horizontal line can intersect a graph more than once then the graph of the inverse is NOT a function

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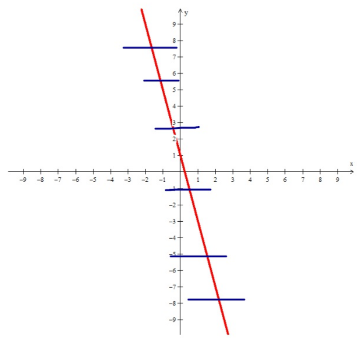
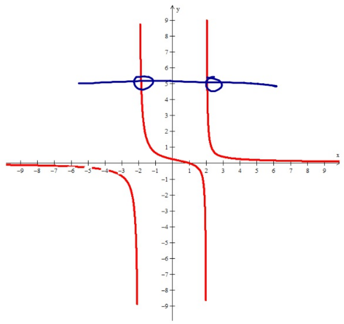
Use what you may know about the graph of each or graph them using the graphing calculator to determine if the inverse relation of each is a function or not.

a) $f(x) = -4x + 1$

Yes, the inverse is a function because no Horizontal Line will touch the orginal graph more than once so no Vertical Line will touch the inverse more than once.

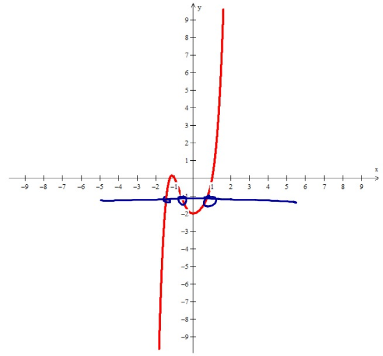


b) $y = \frac{x-1}{x^2-4}$



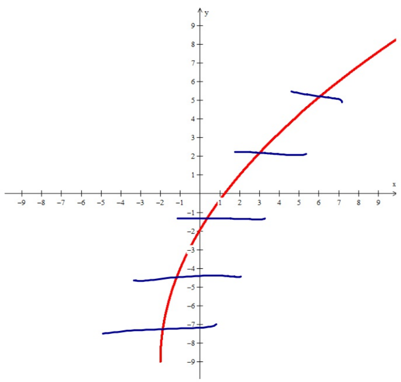
No, the inverse is not a function because there is a Horizontal Line that will touch the orginal graph more than once which meant that there is Vertical Line that will touch the inverse more than once.

c) $y = x^5 - x^3 + 2x^2 - 2$



No, the inverse is not a function because there is a Horizontal Line that will touch the orginal graph more than once which meant that there is Vertical Line that will touch the inverse more than once.

d) $f(x) = 5\sqrt{x+2} - 9$



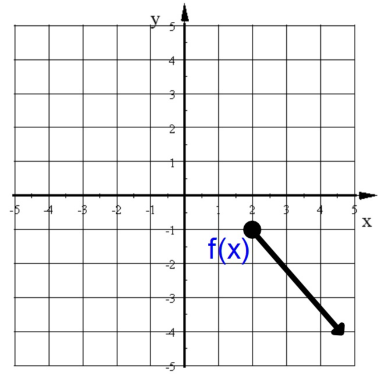
Yes, the inverse is a function because no Horizontal Line will touch the orginal graph more than once so no Vertical Line will touch the inverse more than once.

Original Relation		Inverse Relation
f(x)	Becomes →	$f^{-1}(x)$
The point (a,b)	Becomes →	The point (b,a)
Domain of f(x)	Becomes →	Range of $f^{-1}(x)$
Range of f(x)	Becomes →	Domain of $f^{-1}(x)$
Graph of f(x)	Reflect over y=x → Becomes	Graph of $f^{-1}(x)$

The concept of an Inverse Relation is all about...

switching X and Y

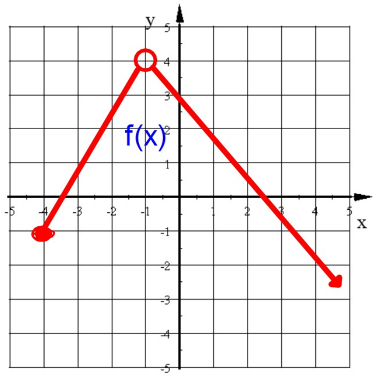
Given the graph of f(x), find the domain and range of $f^{-1}(x)$



Start by finding Domain and Range of the original relation.

Domain of f(x):	Range of f(x):
$x \geq 2$	$y \leq -1$
Domain of $f^{-1}(x)$:	**Range of $f^{-1}(x)$:**
$x \leq -1$	$y \geq 2$

Given the graph of f(x), find the domain and range of $f^{-1}(x)$



Start by finding Domain and Range of the original relation.

Domain of f(x):	Range of f(x):
$-4 \leq x < -1,\ x > -1$	$y < 4$
Domain of $f^{-1}(x)$:	**Range of $f^{-1}(x)$:**
$x < 4$	$-4 \leq y < -1,\ y > -1$

What I want you to know from Sec 7-7:

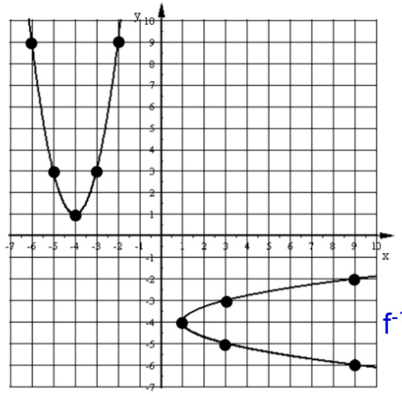
1. Given an original relation be able to tell if the inverse is a function or not.
2. Know the relationship between the Domain and Range of an original relation and the Domain and Range of the inverse relation.
3. Be able to write the equation of the inverse relation.

Solve this equation for M

$$Q = \frac{\sqrt{CM - R}}{G} + A$$

$$m = \frac{[G(Q-A)]^2 + R}{C}$$

$f(x) = 2(x+4)^2 + 1$



Equations of Inverses

1. Switch the variables x and y
2. Solve equation for y

$$x = 2(y+4)^2 + 1$$

$f^{-1}(x) = \pm\sqrt{\frac{x-1}{2}} - 4$

Find the equation of the inverse for each function

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

   $x = 2y - 3$

2. $f(x) = (x+5)^3 - 7$ $\quad f^{-1}(x) = \sqrt[3]{x+7} - 5$

   $x = (y+5)^3 - 7$