Warm-Up...

Complete Chart For... $y = af(b(x-c))+d$

$3y - 7 = -9f(12x - 24) + 2$

$\frac{3y}{3} = \frac{-9}{3} f(12x-24) + \frac{9}{3}$

$y = -3f(12(x-2)) + 3$

$\frac{\not{p}(w+8)}{\not{p}}$

When identifying translations be sure that you indicate both the number of units and direction of the shift.

[6]

Reflected in x-axis	YES or NO (circle correct solution)
Reflected in y-axis	YES or NO (circle correct solution)
Horizontal translation of...	Rt. 2
Vertical translation of...	Up 3
Horizontally stretched by a factor of...	1/12
Vertically stretched by a factor of ...	3

The base function $y = f(x)$ is reflected in the y-axis, stretched horizontally by a factor of $\frac{3}{4}$, stretched vertically by a factor of 7, and translated 3 units to the right and 8 units up.

(a) Write the equation of the transformed function $g(x)$. [4]

(b) Write a mapping rule that would transform the graph of $f(x)$ into the graph of $g(x)$. [4]

(c) If the ordered pair (-21 , 5) lies on the graph of $f(x)$, what are the coordinates of this point on the graph of $g(x)$? [2]

a) $g(x) = 7f\left(-\frac{4}{3}(x-3)\right)+8$

b) $(x, y) \rightarrow \left(-\frac{3}{4}x+3, 7y+8\right)$

c) $(-21, 5) \rightarrow \left(-\frac{3}{4}(-21)+\frac{3}{1}, 7(5)+8\right)$

$\rightarrow \left(\frac{63}{4}+\frac{3}{1}, 35+8\right)$

$\underline{18.75}$

$\rightarrow \left(\frac{75}{4}, 43\right)$

Quiz

→ Transformations → Reflections
Stretches
Translations

⇒ Mapping Notation

→ Function Notation

→ Piecewise: Sketch

↳ Absolute Value functions

Try This...

The graph of the function $y = 2x^2 + x + 1$ is stretched vertically about the x-axis by a factor of 2, stretched horizontally about the y-axis by a factor of $\frac{1}{3}$, and translated 2 units to the right and 4 units down. Write the equation of the transformed function.

$$-\tfrac{1}{16}$$

$$y = 2\left(x^2 + \tfrac{1}{2}x + \tfrac{1}{16}\right) + \tfrac{1}{1} - \tfrac{1}{8}$$

$$\times 2 \qquad -2$$

$$y = 2\left(x + \tfrac{1}{4}\right)^2 + \tfrac{7}{8}$$

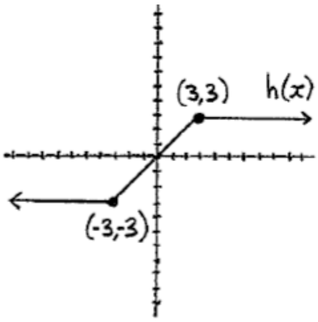
$$y = 4\left(3\left(x - \tfrac{7}{4}\right)\right)^2 - \tfrac{25}{8}$$

$$\tfrac{7}{8} - \tfrac{4}{1}$$

$$\tfrac{7}{8} - \tfrac{32}{8}$$

$$-\tfrac{25}{8}$$

War



Given the graph of $h(x)$ above, match the following four functions with their graphs.

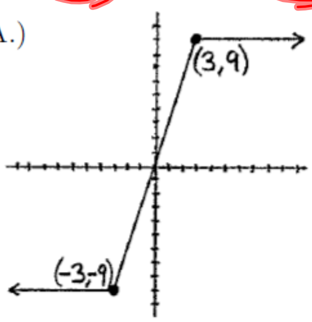
29.) $3h(x)$ A

30.) $\frac{1}{3}h(x)$ D

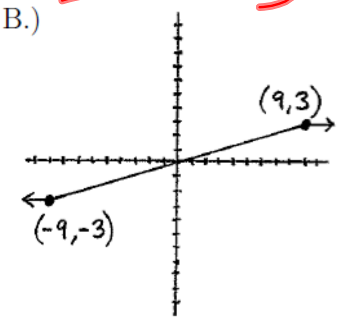
31.) $h(3x)$ C

32.) $h(\frac{x}{3})$ B

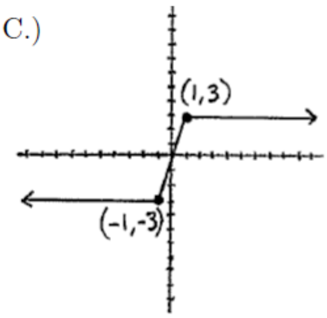
A.)



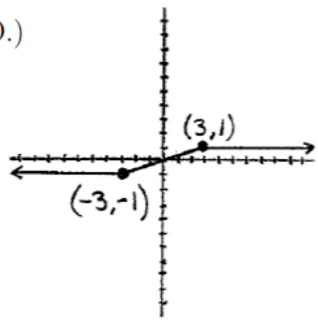
B.)



C.)



D.)



Inverse of a Relation

An inverse function is a second function which undoes the work of the first one.

1. Introduction

Suppose we have a function f that takes x to y, so that

$$f(x) = y.$$

An inverse function, which we call f^{-1}, is another function that takes y back to x. So

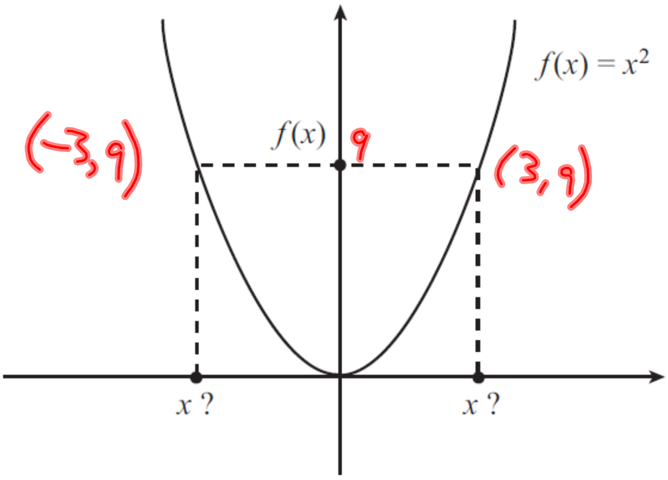
$$f^{-1}(y) = x.$$

For f^{-1} to be an inverse of f, this needs to work for every x that f acts upon.

Did You Know?

The -1 in $f^{-1}(x)$ does not represent an exponent; that is $f^{-1}(x) \neq \frac{1}{f(x)}$.

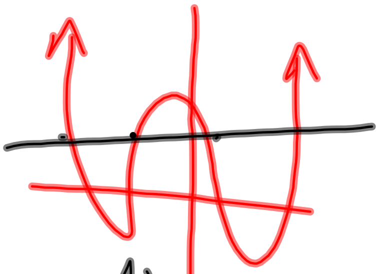
Not all functions have inverses. For example, let us see what happens if we try to find an inverse for $f(x) = x^2$.



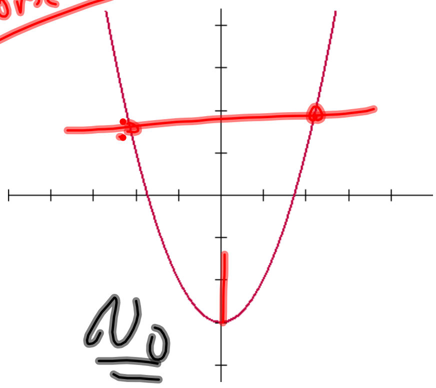
A function is said to be a one-to-one function if it never takes on the same value twice.

Horizontal Line test

Look at this function...

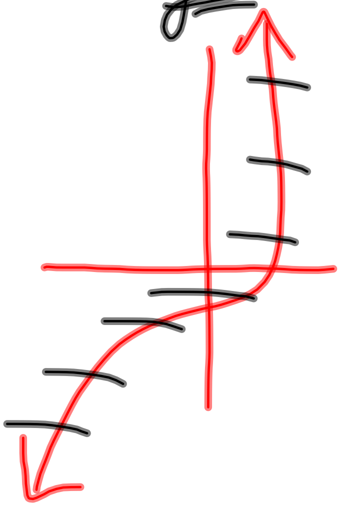


Not one-to-one



No

yes



If a function is a one-to-one function then it will posses what is called an inverse function.

If f is a one-to-one function with domain A and range B. Then its **inverse function,** f^{-1} has domain B and range A and is defined by

$$f^{-1}(y) = x \Leftrightarrow f(x) = y$$

for any y in B.

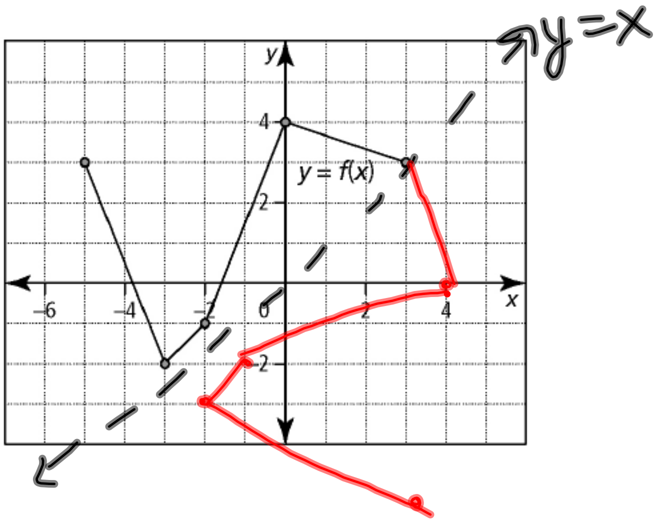
$$\boxed{\begin{array}{l} \text{domain of } f^{-1} = \text{range of } f \\ \text{range of } f^{-1} = \text{domain of } f \end{array}}$$

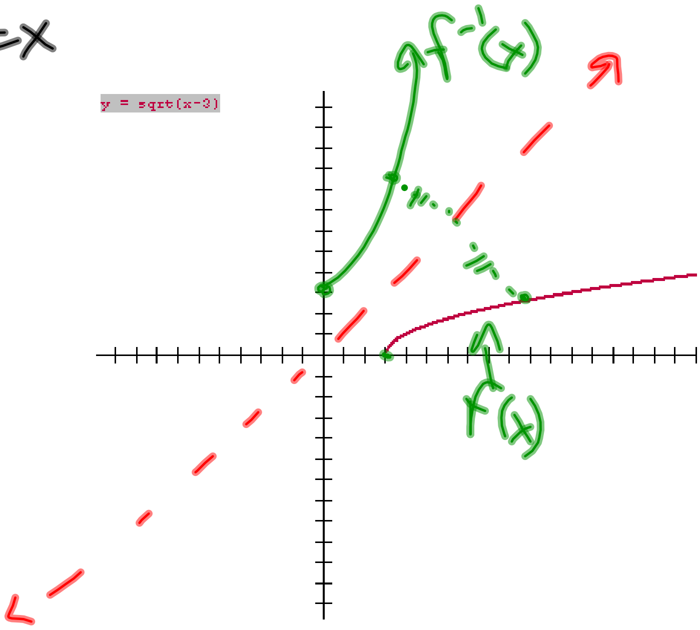
In plain english....the x and y coordinates will just switch places

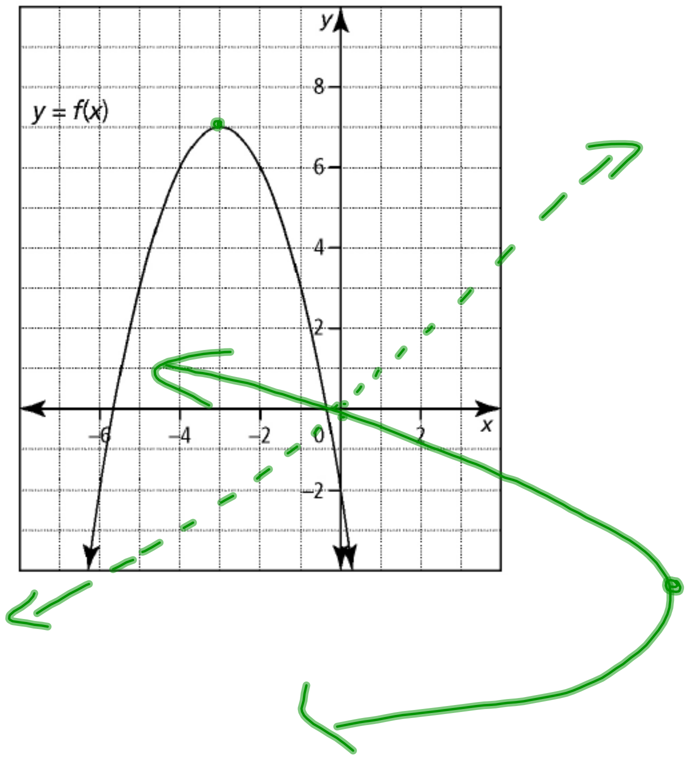
The inverse of a relation is found by interchanging the x-coordinates and y-coordinates of the ordered pairs of the relation. In other words, for every ordered pair (x, y) of a relation, there is an ordered pair (y, x) on the inverse of the relation. This means that the graphs of a relation and its inverse are reflections of each other in the line $y = x$.

$(x, y) \rightarrow (y, x)$

How does this play out graphically?







What if given the function algebraically?

Determine algebraically the equation of the inverse of each function.

a) $f(x) = 3x - 6$ **b)** $f(x) = \frac{1}{2}x + 5$

c) $f(x) = \frac{1}{3}(x+12)$ **d)** $f(x) = \frac{8x+12}{4}$

(a) $y = 3x - 6 \Longrightarrow$

x	y
−1	−9

$x = 3y - 6$

$\frac{3y}{3} = \frac{x}{3} + \frac{6}{3}$

$y = \frac{1}{3}x + 2$

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

x	y
−9	−1

b) $y = \frac{1}{2}x + 5$

$x = \frac{1}{2}y + 5$

$2x = y + 10$

$y = 2x - 10$

$\underline{f^{-1}(x) = 2x - 10}$

$x = \frac{1}{3}(y + 12)$

$3x = y + 12$

$y = 3x - 12$

$\underline{f^{-1}(x) = 3x - 12}$