March 21, 2017

8-5 Inverse Functions

Objectives:

-I can find the inverse of a given function

-I can verify that an inverse is a function

Inverse of a Relation

The **inverse of a relation** consisting of the ordered pairs (x, y) is the set of all ordered pairs (y, x).

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

$g(x)$

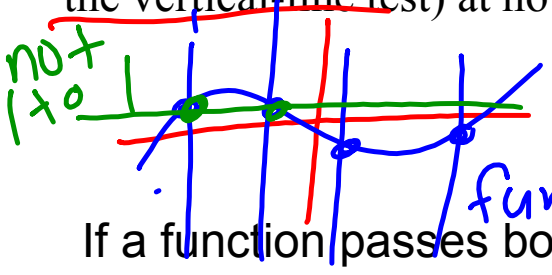
$g^{-1}(x)$

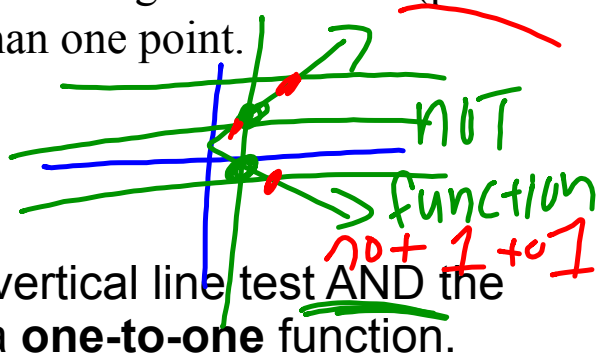
Represents the inverse of the function $f(x)$

$+$, $-$

Horizontal-Line Test

The inverse of a function is a function if and only if every horizontal line intersects the graph of the given function (passed the vertical line test) at no more than one point.



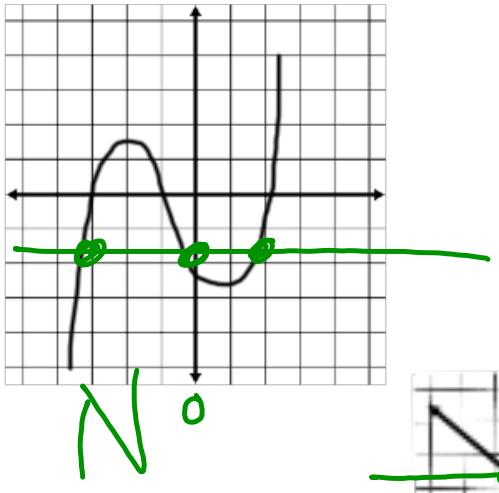


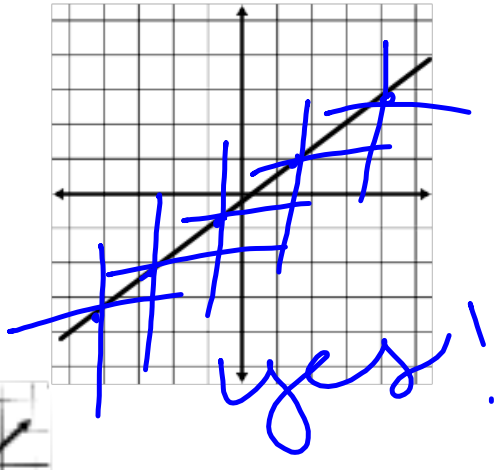
If a function passes both the vertical line test AND the horizontal line test, then it is a **one-to-one** function.

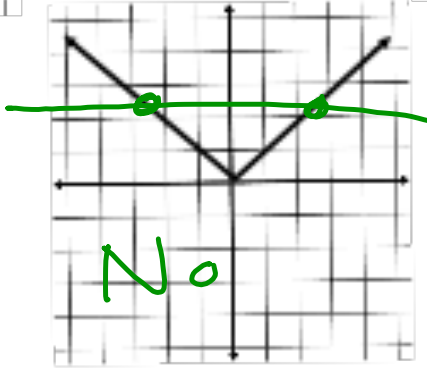
$f(x)$ function

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

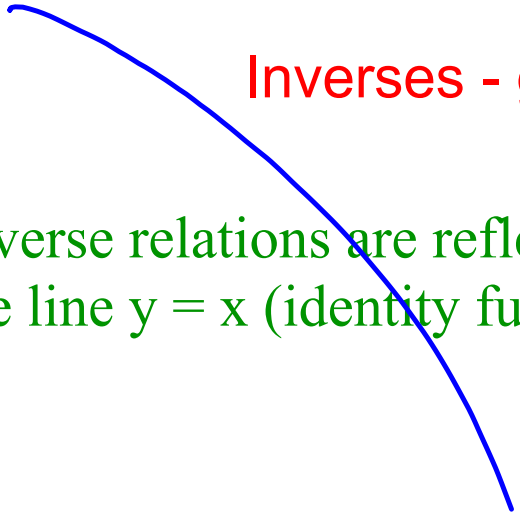
Determine whether the function is one-to-one.





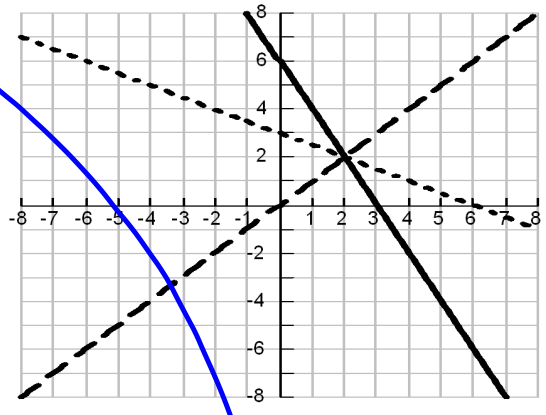


Inverses - graphically



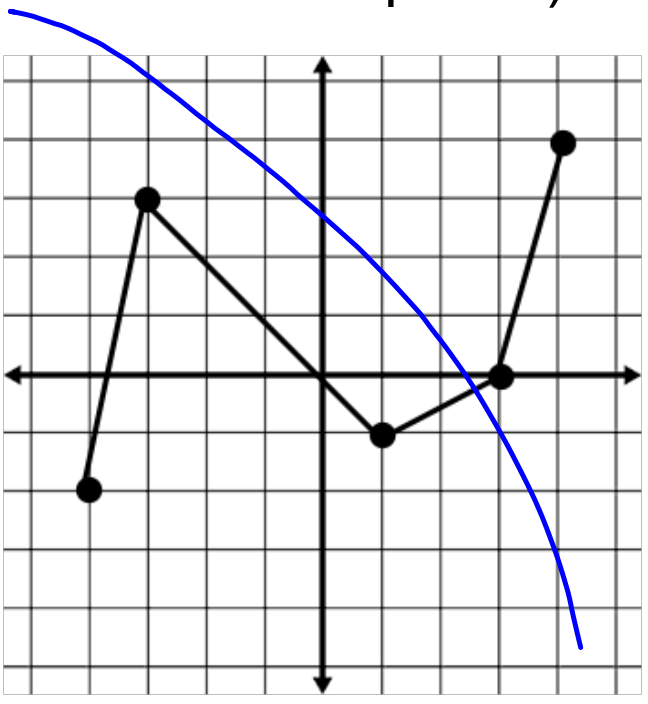
Inverse relations are reflections of each other over the line y = x (identity function)

Show $f(x) = 6 - 2x$ and $g(x) = \dfrac{6 - x}{2}$ are inverses graphically



f(x):	(1,4)	(3,0)	(4,-2)
g(x):	(4,1)	(0,3)	(-2,4)

Graph the inverse of the graph. (Use y=x to find inverse points)



To find the inverse equation of a function

1. Change $f(x)$ to y.
2. Interchange x and y
3. Solve for y - get y by itself
4. Change new y to $f^{-1}(x)$

Given $a^n = b$

If n is odd: $a = \sqrt[n]{b}$

If n is even: $a = \pm\sqrt[n]{b}$

Find the inverse of each function

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

$y = x^2 + 1$

$x = y^2 + 1$

$-1 \quad -1$

$\sqrt{x-1} = \sqrt{y^2}$

$\sqrt{x-1} = y$

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

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

$g(x) = 2x - 3$

$y = 2x - 3$

$x = 2y - 3$

$+3 \quad +3$

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

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

Find the inverse of each function.
Is the inverse a function?

$h(x) = 2x^3 + 3$

$y = 2x^3 + 3$

$x = 2y^3 + 3$

$-3 \quad -3$

$\frac{x-3}{2} = \frac{2y^3}{2}$

$\sqrt[3]{\frac{x-3}{2}} = \sqrt[3]{y}$

$h^{-1}(x) = \sqrt[3]{\frac{x-3}{2}}$

$g(x) = \sqrt[3]{x} - 3$

$y = \sqrt[3]{x} - 3$

$x = \sqrt[3]{y} - 3$

$+3 \quad +3$

$(x+3)^3 = \sqrt[3]{y}^3$

$g^{-1}(x) = (x+3)^3$

Find the inverse of each function.
Is the inverse a function?

$f(x) = 2x + 5$

$g(x) = \sqrt{x - 7}$

$y = \sqrt{x-7}$

$x^2 = \sqrt{y-7}^2$

$x^2 = y - 7$

$+7 \quad +7$

$x^2 + 7 = y$

$x^2 + 7 = g^{-1}(x)$

Find the inverse of each function.
Is the inverse a function?

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

Find the inverse of each function.
Is the inverse a function?

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

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

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