Bellwork in Canvas (in quizzes)

Sec 1.5

Inverse Relations and Functions - switching the x and y

There are different ways to find the inverse of a function as well as determining if a function has an inverse.

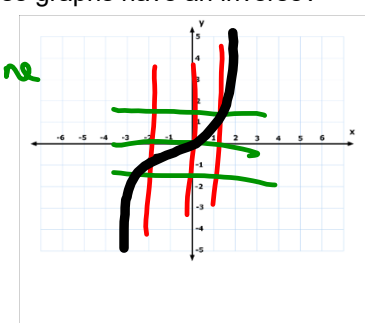
Remember the Vertical Line test? To determine if a graph has an inverse, we do a horizontal line test.

One to One - a function is said to be one to one if it passes both the vertical and horizontal line tests.

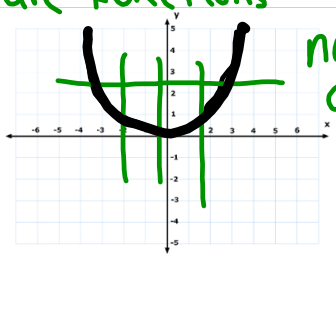
This means that the inverse is also a function

examples: do these graphs have an inverse? → which are functions

one to one



not one to one



Finding the inverse of a function Algebraically

Inverse - switch the x and y
$f^{-1}(x)$ means inverse

example: $f(x) = 2x + 5$

$y = 2x + 5$ Replace f(x) with y

$x = 2y + 5$ Switch the x and y

$-5 \quad -5$

$x - 5 = 2y$

$\frac{x-5}{2} = \frac{2y}{2}$ Solve for y

$\frac{x-5}{2} = y$

$f^{-1}(x) = \frac{x-5}{2}$ Switch y with $f^{-1}(x)$

Find the inverse of the functions.

example: $f(x) = \frac{x+3}{x-2}$

Replace f(x) with y: $y = \frac{x+3}{x-2}$

Switch x and y: $\frac{x}{1} = \frac{y+3}{y-2}$

Solve for y:

$x(y-2) = 1(y+3)$

$xy - 2x = y + 3$

$xy - y = 2x + 3$

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

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

Switch y for $f^{-1}(x)$: $f^{-1}(x) = \frac{2x+3}{x-1}$

example: $h(x) = \sqrt{x+7}$

$y = \sqrt{x+7}$

$x^2 = \left(\sqrt{y+7}\right)^2$

$x^2 = y + 7$

$-7 \quad -7$

$x^2 - 7 = y$

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

Verifying Inverse functions

- If two functions, f(x) and g(x), composites both equal x, then they are inverses.

$$f(g(x)) = g(f(x)) = x$$

ex. Verify that the two functions are inverses:

$f(x) = 3x - 4$ $\qquad$ $g(x) = \frac{x+4}{3}$

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

$x + 4 - 4$

x

$g(f(x)) = \frac{3x - 4 + 4}{3} = \frac{3x}{3} = x$

Because $f(g(x))$ and $g(f(x)) = x$ f and g are inverses