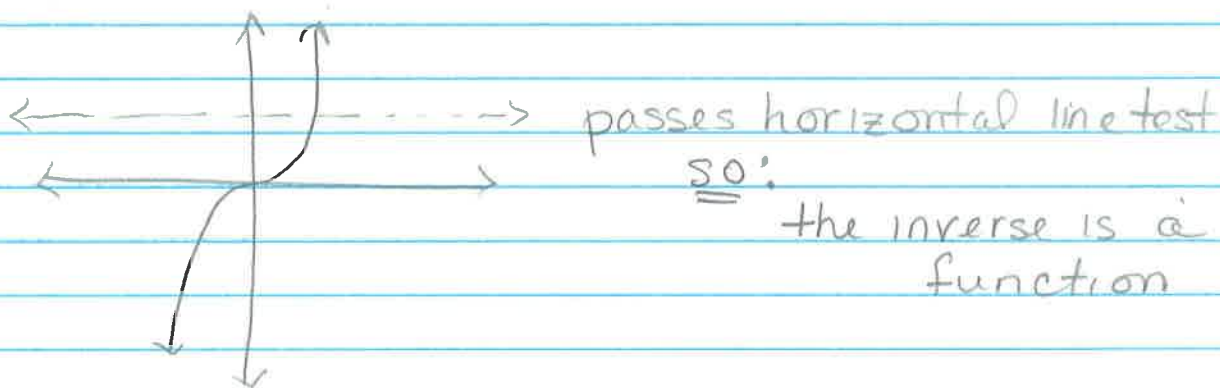


Algebra II - Notes

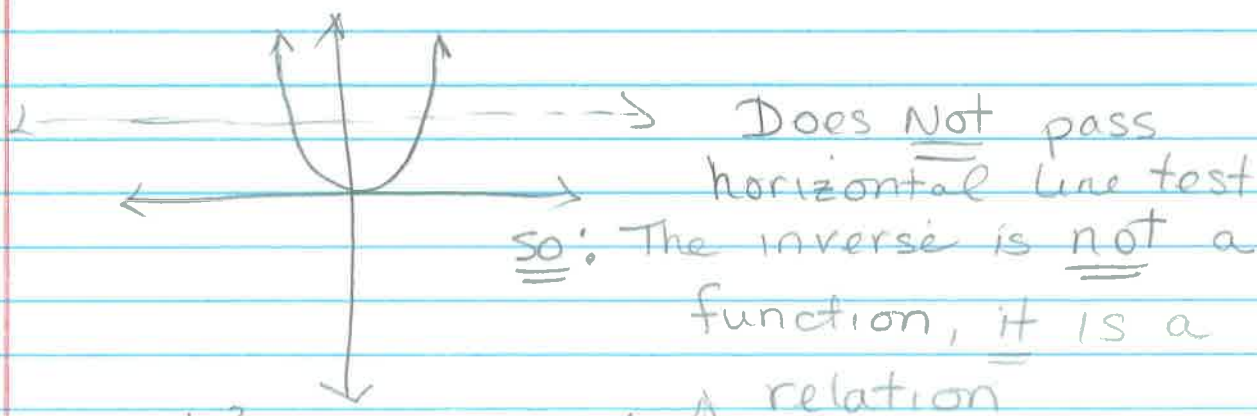
1-14-14 6-2 Inverse functions & Relations Part 2

- How to determine whether two functions are inverses
- Is the inverse a function or relation?
 - Apply the Horizontal Line TEST to original function

Is the inverse of $f(x) = x^3$ a function?



What about $f(x) = x^2$?



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



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Inverse Functions: Two functions f and g are inverse functions if and only if both of their compositions are the identity function

Symbols \rightarrow $f(x)$ and $g(x)$ are inverses if and only if $(f \circ g)(x)$ and $(g \circ f)(x) = X$

$f(x)$ & $g(x)$ are inverses

$$(f \circ g)(x) = X \quad (g \circ f)(x) = X$$

Are f and g inverses of each other?

$$f(x) = \frac{1}{3}x - 2 \quad g(x) = 3x + 6$$

check with a \neq : $f(3) = \frac{1}{3}(3) - 2 = 1 - 2 = -1$
 $g(-1) = 3(-1) + 6 = -3 + 6 = 3$

Yes -
they are
inverses
of
each
other

$$\begin{aligned} (f \circ g)(x) &= f(g(x)) = f(3x+6) = \frac{1}{3}(3x+6) - 2 = \\ & \quad x + 2 - 2 = X \\ (g \circ f)(x) &= g(f(x)) = g\left(\frac{1}{3}x - 2\right) = 3\left(\frac{1}{3}x - 2\right) + 6 \\ & \quad x - 6 + 6 = X \end{aligned}$$

* If first function does not spit out an X — no need to do second — because both must = X

① Determine whether $f(x) = \frac{3}{4}x - 6$ and $g(x) = \frac{4}{3}x + 8$ are inverse functions:

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

$$\frac{3}{4}\left(\frac{4}{3}x + 8\right) - 6 = x + 6 - 6 = \underline{\underline{x}}$$

$$(g \circ f)(x) = g(f(x)) = g\left(\frac{3}{4}x - 6\right) =$$

$$\frac{4}{3}\left(\frac{3}{4}x - 6\right) + 8 = x - 8 + 8 = \underline{\underline{x}}$$

Yes -
Inverse
Functions

② $f(x) = \frac{2}{3}x^2$ $g(x) = \sqrt{\frac{2}{3}x}$
 $x=3$ $f(3) = \frac{2}{3}(3^2) = \frac{2}{3}(9) = 6$ $g(3) = \sqrt{\frac{2}{3}(3)} = \sqrt{\frac{6}{3}} = \sqrt{2}$

$$(f \circ g)(x) = f(g(x)) = f\left(\sqrt{\frac{2}{3}x}\right) =$$

$$\frac{2}{3}\left(\sqrt{\frac{2}{3}x}\right)^2 = \frac{2}{3}\left(\frac{2}{3}x\right) = \frac{4}{9}x$$

No - are not inverse functions

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