Date: 9/6/18

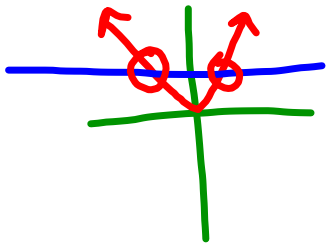
Chp: Chp. 1:5 → Functions & Logarithms

Obj:
- Identify 1-1 functions
- Find inverses of functions
- Verify that 2 functions are inverses.

* One-to-One Functions (1-1) = All about the y's. Use the horizontal line test to test.

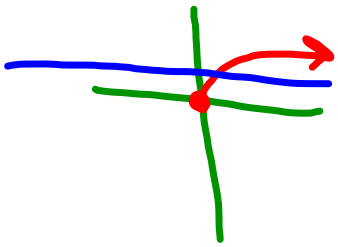
Ex. 1

a) $f(x) = |x|$



not 1-1

b) $f(x) = \sqrt{x}$



1-1

* Inverse of a function = $f^{-1}(x)$;
found by switching x & y then solve for y.

Ex.2

$f(x) = -2x + 4$

$x = -2y + 4$

$x - 4 = -2y$

$\frac{x-4}{-2} = y$

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

same $\rightarrow$ $-\frac{1}{2}x + 2 = f^{-1}(x)$

* To see if 2 functions are inverses of each other, compose them! If the answers are both x then they are inverses!

Ex. 3 - Find $f^{-1}(x)$ & verify.

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

$x = y^2+2y+1$

$x = (y+1)(y+1)$

$\sqrt{x} = \sqrt{(y+1)^2}$

$\sqrt{x} = y+1$

$g(x)$ $-1+\sqrt{x} = y^{-1}$

$(f \circ g)(x) \rightarrow (-1+\sqrt{x})^2+2(-1+\sqrt{x})+1$

$x-2\sqrt{x}+x-2+2\sqrt{x}+1$

x

$(g \circ f)(x) = -1+\sqrt{x^2+2x+1}$

$= -1+\sqrt{(x+1)^2}$

$= -1+x+1 = x$

$\frac{-\sqrt{x}+-\sqrt{x}}{\sqrt{x}\cdot\sqrt{x}}$

* Inverse of an Exp. Function = Log Function!

$y = a^x$ * Base a Log Function

$y = 3^x$ $y = \log_a x$ $D = (0, \infty)$

$R = (-\infty, \infty)$

2 Common Bases for Logs

1) 10 → $\log_{10} x = \log x$

2) e → $\log_e x = \ln x$

*Natural Log Function = $y = \ln x$

* Common Log Function = $y = \log x$ $\log_2 x$

Inverse Properties of $a^{f(x)}$ & $\log_a x^{g(x)}$

Base a → $a^{\log_a x} = x$ & $\log_a a^x = x$

$a > 1, x > 0$

Inverse Properties of $e^{f(x)}$ & $\ln x^{g(x)}$

Base e → $e^{\ln x} = x$ & $\ln e^x = x$

$x > 0$

Ex. 4 - Solve for x.

a) $\ln x = 3t + 5$

$e^{\ln x} = e^{3t+5}$

$x = e^{3t+5}$

b) $e^{2x} = 10$

$\ln e^{2x} = \ln 10$

$\frac{2x}{2} = \frac{\ln 10}{2}$

$x = 1.15$

Properties of Logs/Natural Logs

1) Product Rule → $\log_a xy = \log_a x + \log_a y$

2) Quotient Rule → $\log_a \frac{x}{y} = \log_a x - \log_a y$

3) Power Rule → $\log_a x^y = y \log_a x$

Change of Base Formula

$$\log_a x = \frac{\ln x}{\ln a}$$

Ex. 5 → Graph.

$$f(x) = \log_2 x$$

$$\log_2 x = \frac{\ln x}{\ln 2}$$

$$f(x) = \frac{\ln x}{\ln 2}$$

Homework:

p. 44 (#1-6, 7-21 odds, 33, 34, 37-41 odds, 48)