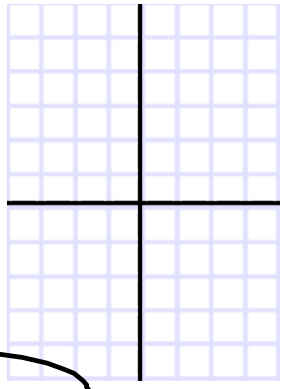
3.2a Logarithmic Functions and their Graphs



Since the function $f(x) = a^x$, where $a > 0$ passes the horizontal line test --> it has an inverse! That inverse is the logarithmic function with base a.

Definition of a Logarithmic Function

For $x > 0$, $a > 0$, and $a \neq 1$ $\quad y = \log_a x$ if any only if $x = a^y$

The function given by $f(x) = \log_a x$ is called the logarithmic function with base a.

"log base a of x"

read as

Ex 1: Write the logarithmic equation in exponential form:

a. $\log_3 81 = 4$

b. $\log_{10}(1/1000) = -3$

c. $\log_5 \sqrt[3]{25} = 2/3$

Ex 2: Write the exponential equation in logarithmic form

a. $8^2 = 64$

b. $9^{(3/2)} = 27$

c. $10^{-3} = 0.001$

Ex 3: Evaluate each:

a. $f(x) = \log_2 x$, if $x = 32$ _____

b. $f(x) = \log_{10} x$, $x = 1/100$ _____

c. $f(x) = \log_{10} x$ if $x = 2.5$ (use calc.) _____

d. $f(x) = \log_{10} x$ if $x = -2$ (use calc.) _____

Properties of Logarithms!!!

1. $\log_a 1 =$ _____ because $a^0 =$ _____
2. $\log_a a =$ _____ because $a^1 =$ _____
3. $\log_a a^x =$ ____ and $a^{\log_a x} =$ ____ ← inverse properties
4. If $\log_a x = \log_a y$, then _____ ← one-to-one property

Ex 4: Solve using Properties of Logarithms:

a. $\log_2 x = \log_2 3$

b. $\log_4 4 = x$

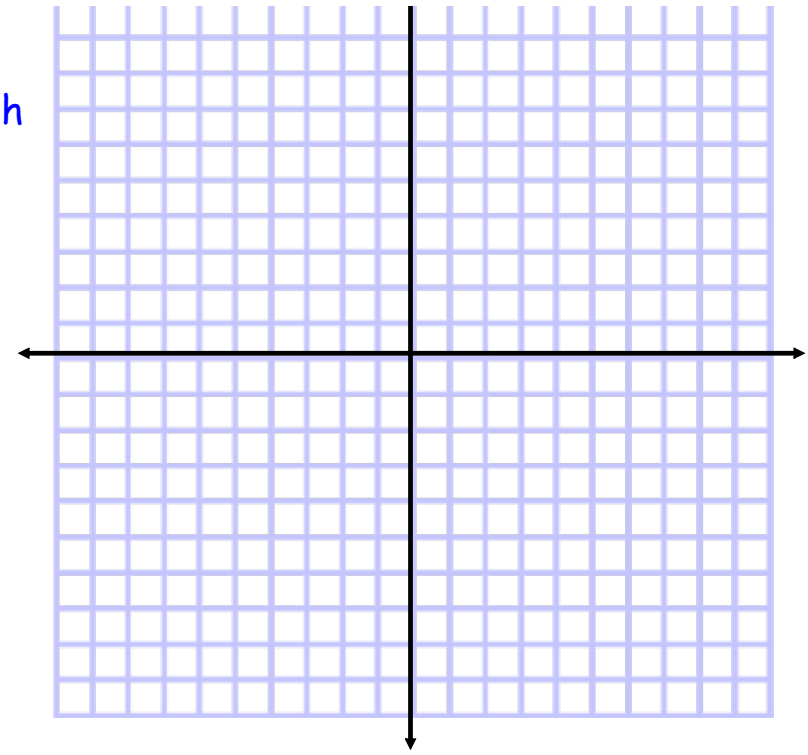
c. $\log_5 5^x$

d. $7^{\log_7 14}$

Ex 5: In the same coordinate plane, sketch each function by hand.

a. $f(x) = 2^x$

b. $g(x) = \log_2 x$



p. 199-201 (1, 3, 7-43 odd, 51-54, 109)