Precalc 11.4

Evaluate expressions involving logarithms
Solve equations and inequalities involving logarithms
Graph logarithmic functions and inequalities

inverse function

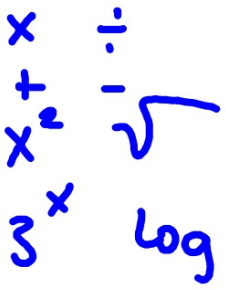
exponent

logarithm

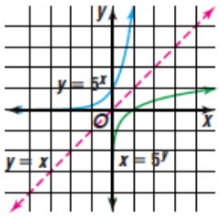
logarithmic function

base

exponent



$f(x)$: $y = 5^x$ $f^{-1}(x)$: $x = 5^y$



x & y trade places
reflect over y=x

cut & paste

Logarithmic Function	The logarithmic function $y = \log_a x$, where $a > 0$ and $a \neq 1$, is the inverse of the exponential function $y = a^x$. So, $y = \log_a x$ if and only if $x = a^y$.

Exponent form: Base $^{\text{power}}$ = number
Example: $10^2 = 100$

→ Log form: exponent = $\log_{(\text{base})}$ number

Example: $2 = \log_{10} 100$ = 2

$10^2 = 100$

1 Write each equation in exponential form.

a. $\log_{125} 25 = \frac{2}{3}$

b. $\log_8 2 = \frac{1}{3}$

$125^{\frac{2}{3}} = 25$

2 Write each equation in logarithmic form.

a. $4^3 = 64$

b. $3^{-3} = \frac{1}{27}$

$\log_4 64 = 3$

$\log_3 \frac{1}{27} = -3$

3 Evaluate the expression $\log_7 \frac{1}{49}$. $= -2$

$7^{-2} = \frac{1}{49}$

$\log_7 \frac{1}{49} = x$

$7^x = 7^{-2}$

$7^x = \frac{1}{49}$

$x = -2$

$7^x = \frac{1}{7^2}$

exp $16^{\frac{1}{2}} = 64^{\frac{1}{3}}$

$16^{\frac{1}{2}} = 4$

Always check bases...

5 Solve each equation.

a. $\log_p 64^{\frac{1}{3}} = \frac{1}{2}$

b. $\log_4 (2x + 11) = \log_4 (5x - 4)$

$p^{\frac{1}{2}} = 64^{\frac{1}{3}}$

$\left(p^{\frac{1}{2}}\right)^2 = (4)^2$

$p = 16$

$2x + 11 = 5x - 4$

$-2x + 4 \quad -2x + 4$

$15 = 3x$

$5 = x$

If I add exponents, what is going on?
If I multiply exponents, what is going on?

$$x^3 \cdot x^4 = x^7$$

$$(x^4)^5 = x^{20}$$

c. $\log_{11} x^2 + \log_{11} (x+3) = \log_{11} 6$

$\log_{11} x(x+1) = \log_{11} 6$

$x(x+1) = 6$

$x^2 + x - 6 = 0$

$(x+3)(x-2) = 0$

$x = -3$ $x = 2$

-6
3 -2
1

11.4

21 - ~~57~~ 0

21 - 47 0