SM3-A HANDOUT 5-6 (Log of a Quotient Property of Logarithms The Change of Base formula, Simplifying Logarithms)

1. $f(x) = 3(4)^{x-1} + 5$ Find $f^{-1}(x)$

2. $\log_3 x^4 y$

Expand the log:

3. $3\log 2 + 2\log x + \log 3 + 5\log y$

Condense the log:

4. $7 = 2(3)^x$

Convert to a logarithm:

5. $3\log_5(x-6) = 6$

Convert to an exponential;

6. $f(x) = 3\log(x+2) - 5$

What is the
Domain and range?

7. $f(x) = 2\log(2x-4) - 6$

What is the logarand?

8. What is the asymptote?

9. What do I mean when I say: "A log is an exponent"?

Log of a Product Property of Logarithms:

$$\log_b(RS) = \log_b R + \log_b S$$

$$\log_2 15 = \log_2 3 + \log_2 5$$

log of a product = sum of the logs of the factors.

Log of Power Property of Logarithms

$c \log_b R^{(c)} \rightarrow c \log_b R$

$\log_2 3^4$

$\log 32$

$\frac{x^2}{y^3}$ Using properties of exponents: rewrite this so the 'y' term is NOT in the denominator. $x^2 y^{-3}$

$\log_3\left(\frac{5}{2}\right) = \log_3\left(5 * 2^{-1}\right)$ Negative Exponent Property

[ ] Log of a Product Property

[ ] Log of a Power Property

[ ] Definition of Subtraction: (adding a negative is subtraction)

Log of a Quotient Property

$\log_b\left(\frac{R}{S}\right) = \log_b R - \log_b S$

$\log_3\left(\frac{5}{2}\right)$ "expand the quotient" [ ]

$\ln 8 - \ln 3$ "condense the quotient" [ ]

"Negative Log"→ denominator of the logarand

Expand the Quotient

$\log \frac{4}{5}$ [ ] [ ]

$\ln \frac{3}{7}$ [ ]

Condense the quotient

$\log_4 5 - \log_4 2$ [ ]

$\log_5 8 - \log_5 16$ [ ]

Expand the Logarithm

$\log\left(\frac{2x}{3y^5}\right) = \log 2x - \log 3y^5$ The denominator is a product!

$= \log 2x - (\log 3 + 5\log y)$

Distributive property!

[ ]

[ ]

Logs of factors in the numerator will be positive.
Logs of factors in the denominator will be negative.

Expand the quotient

$$\ln\frac{zx^2}{5y^3}$$

$$= \log_4\left(\frac{w^5}{x^7}\right)^2$$

$$\log_4\frac{2\sqrt{x}}{4yz}$$

Change-of-Base Formula for Logarithms

$$\log_c a = \frac{\log_b a}{\log_b c}$$

Change to log base 10 or base 'e' (your calculator can do these).

Convert to base 10.

$$\log_4 5 = \frac{\log_{10} 5}{\log_{10} 4} = \frac{0.699}{0.6021} = 1.161$$

$$\log_4 5 = \frac{\ln 5}{\ln 4} = \frac{1.609}{1.386} = 1.161$$

Simplify

$$\log_2 2$$

$$\log_2 2 = x$$

$$2^x = 2$$

$$x = 1$$

Using Change of base:

$$\log_2 2 = \frac{\log 2}{\log 2} = 1$$

Simplify: $\log_4 16$ "4 raised to what power equals 16?"

$\log_4 4^2$ $2\log_4 4$ $2(1) = 2$

$\log_2 \sqrt{2}$

"2 raised to what power equals the square root of 2?"

Simplify: $5\log_3 27$

$5\log_3 3^3$ $(3*5)\log_3 3$ 15

$6\log_2(16) - 4$

Simplify:

$8\log_5(125) + 3$

$2\log_9(81) - 5$

$-6\log_3(\sqrt[2]{3}) + 4$