10-4 Common Logarithms

Objective: Solve exponential equations and inequalities using common logs.
Evaluate logarithmic expressions using the Change of Base Formula.

I. Use a calculator to evaluate each expression to four decimal places.

EX 1. log 5 $\approx .69897 = .6990$

EX 2. log 7.2 $\approx .85733 = .8573$

II. Solve.

Ex 3. $3^x=11$

Way #1

$\log_3 11 = x$

$\frac{\log 11}{\log 3} = x$

$2.1827 = x$

* See last Slide

Way #2

$\log 3^x = \log 11$

$x \cdot \log 3 = \log 11$

$x = \frac{\log(11)}{\log(3)}$

$x = 2.1827$

EX 4. $5^{x+2}=62$

$\log 5^{(x+2)} = \log 62$

$(x+2)\log 5 = \log 62$

$x+2 = \frac{\log 62}{\log 5}$

$x = \frac{\log(62)}{\log(5)} - 2$

$x = .5643$

EX 5. $2^{7x} > 3^{5x-3}$

$\log 2^{7x} > \log 3^{5x-3}$

$7x \log 2 > (5x-3)\log 3$

$7x\log 2 > 5x\log 3 - 3\log 3$

$7x\log 2 - 5x\log 3 > -3\log 3$

$x(7\log 2 - 5\log 3) > (-3\log(3))$

$\frac{x(7\log 2 - 5\log 3)}{7\log 2 - 5\log 3} > \frac{(-3\log(3))}{(7\log(2) - 5\log(3))}$

$x \mid x > 5.1415$

EX 6. $5^{3y} < 8^{y-1}$

$\log 5^{3y} < \log 8^{y-1}$

$3y\log 5 < (y-1)\log 8$

$3y\log 5 < y\log 8 - \log 8$

$3y\log 5 - y\log 8 < -\log 8$

$\frac{y(3\log 5 - \log 8)}{3\log 5 - \log 8} < \frac{(-\log(8))}{(3\log(5) - \log(8))}$

$y \mid y < -.7565$

III. Change of Base Formula (to base 10).

$\log_a n = \frac{\log n}{\log a}$

EX 7. $\log_5 12 = \frac{\log 12}{\log 5} = 1.5440$

EX 8. $\log_4 25 = \frac{\log 25}{\log 4} = 2.3219$