8.3 DAY 2 Laws of Logarithms

To use transformations to determine equivalent expressions for given logarithmic statements

Example #1: Write each expression as a single logarithm in simplest form. State the restrictions on the variable.
Remember : Bases must be positive and $\neq 1$; can't take the log of a negative number.

a) $\log_7 x^2 + \log_7 x - \frac{5\log_7 x}{2}$ $x>0$

$\log_7 x^2(x) - \frac{5}{2}\log_7 x$

$\log_7 x^3 - \log_7 x^{5/2}$

$\log_7 \frac{x^3}{x^{5/2}}$ * subtract exponents

$\log_7 x^{1/2}$ $\quad \frac{3}{1}\cdot\frac{2}{2} - \frac{5}{2} = \frac{1}{2}$

$\frac{1}{2}\log_7 x$

b) $\log_5(2x-2) - \log_5(x^2+2x-3)$; $x>-3$

$\log_5 \frac{2x-2}{x^2+2x-3}$

$\log_5 \frac{2(x-1)}{(x+3)(x-1)}$ ← How would this look graphically? Would there be asymptotes? Holes?

$\log_5 \frac{2}{x+3}$; $x>-3$, $x\neq 1$

Example #2: Write each expression as a single logarithm in simplest form.

a) $\log_6 2x^7 + \log_6 3x^2 + \log_6 9$

$= \log_6 2x^7(3x^2)(9)$

$= \log_6 54x^9$; $x>0$

$=$

b) $\log 4x\sqrt{y} - \log x^2\sqrt{y}$

$= \log \frac{4x\sqrt{y}}{x^2\sqrt{y}}$ $\quad y>0$, $x>0$

$= \log 4x^{-1}$

c) $\log_7 x^4 + \frac{1}{3}(\log_7 x^2 - \log_7 \sqrt{5x})$

$\log_7 x^4 + \frac{1}{3}(\log_7 \frac{x^2}{(5x)^{1/2}})$

$\log_7 x^4 + \log_7 \frac{x^{2(1/3)}}{(5x)^{1/2(1/3)}}$

$\log_7 x^4 + \log_7 \frac{x^{2/3}}{5^{1/6}x^{1/6}}$

$\log_7 \frac{x^4 \cdot x^{2/3}}{5^{1/6}x^{1/6}}$

$\log_7 \frac{x^{14/3}}{5^{1/6}x^{1/6}}$

$\log_7 \frac{x^{27/6}}{\sqrt[6]{5}} \cdot \frac{(\sqrt[6]{5})^5}{(\sqrt[6]{5})^5}$

$\log_7 \frac{x^{27/6}(\sqrt[6]{5})^5}{5}$ $= \log_7 \frac{x^{27/6}\sqrt[6]{3125}}{5}$

$\frac{4}{1}\cdot\frac{3}{3} + \frac{2}{3}$

$\frac{14}{3}\cdot\frac{2}{2} - \frac{1}{6}$

$\frac{28}{6} - \frac{1}{6}$

$x>0$

8.3 Day 2 ASSIGNMENT

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