Unit 10 Day 4 HW

Monday: Graphing Quiz
Try the 3 warm-up questions.

① $\log \frac{a}{b^2}$

② $\log 14$

③ $\log x^5 y$

④ $\log \frac{\sqrt{x} \cdot y}{z}$

⑤ a. $\log_4 1$

b. 0

⑥ $2p+q+r$

⑦ (4)

⑧ $\log 3 + \log x - 2$

⑨ (3)

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Name_____ Alg 2 CC

Date_____ Unit10Day 4 HW

Use the laws of logarithms to squish questions 1- 4.

1. log a - 2log b = $\log a - \log b^2 = \log \frac{a}{b^2}$

2. log 7 + log 2 = $\log(7 \cdot 2) = \log 14$

3. 5log x + log y = $\log x^5 + \log y = \log x^5 y$

4. $\frac{1}{2}\log_7 x + \log_7 y - \log_7 z$ = $\log_7 x^{1/2} + \log_7 y - \log_7 z$

$= \log_7 \frac{\sqrt{x} \cdot y}{z}$

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5. a. Express as a single logarithm.

$\log_4 8 - \log_4 4 - \log_4 2$

$\log_4 8 + \log_4 x - \log_4 4 - \log_4 2 = \log_4 \frac{8x}{4 \cdot 2}$

$= \log_4 \frac{8x}{8} = \log_4 x$

$\log_4 8 - (\log_4 4 + \log_4 2) = \log_4 \frac{8}{4 \cdot 2} = \log_4 1$

b. Evaluate the logarithm.

$4^{\square} = 1$

$\log_4 1 = x \quad 4^x = 1 \quad x = 0$

6. If log 2 = p and log 3 = q and log 5 = r, represent log 60 in terms of p, q, and r.

$60 = 2^{\square} \cdot 3^{\square} \cdot 5^{\square}$

$\log 60 = \log 2^2 \cdot 3 \cdot 5$

$= 2\log 2 + \log 3 + \log 5$

$= 2p + q + r$

60

$60 = 2^2 \cdot 3 \cdot 5$

6 10

2 3 2 5

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7. If $a = \log 3$ and $b = \log 2$ then which of the following correctly expresses the value of $\log 12$ in terms of a and b?

(1) $a^2 + b$ (3) $2a + b$

(2) $a + b^2$ (4) $a + 2b$

$\log 2^2 \cdot 3$

$2\log 2 + \log 3$

$a + 2b$

3 4

2 2

8. Evaluate the expression of $\log\left(\frac{3x}{100}\right)$.

$\log 3 + \log x - \log 100$

$\log 3 + \log x - 2$

12. Which of the following is equivalent to $\log\left(x^3 / \sqrt[3]{y}\right)$?

(1) $\log x - \log y$ (3) $3\log x - \frac{1}{3}\log y$

(2) $9\log(x - y)$ (4) $\log(3x) - \log\left(y/3\right)$

$\log x^3 - \log y^{1/3}$

$3\log x - \frac{1}{3}\log y$

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Solving Exponential and Logarithmic Equations Unit 10 Day 5

Warm-up:

Use the properties of logarithms to simplify and evaluate the expression.

$\log_3 27 - 2\log_3 3$ $= \log_3 27 - \log_3 3^2$ $= \log_3 \frac{27}{9} = \log_3 3 = 1$ $= 1$

Expand the logarithm

$\log x^3y^5$ $= 3\log x + 5\log y$

$8^{5/3} = (\sqrt[3]{8})^5 = 2^5 = 32$

Solve algebraically for x: $\log_8(9x-4) = 5/3$

$8^{5/3} = 9x - 4$

$\frac{9x}{9} = \frac{8^{5/3}+4}{9}$

$X = ?$

$X = \frac{8^{5/3}+4}{9} = \frac{32+4}{9} = \frac{36}{9} = 4$

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Solving Exponential and Logarithmic Equations

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Earlier in this unit, we used the method of common bases to solve exponential equations. This technique is limited, however, because it requires the two sides of the equation to be expressed using the same base.

Solve $4^x = 8$ using common bases

$(2^2)^x = 2^3$

$2x = 3$

$x = 3/2$

If you can't get a common base...

Steps:

1. Take the log of both sides. (Isolate the expression containing the exponent.)
2. Use the power rule.
3. Isolate the variable.
4. Use calculator!

$7^x = 83$

$\log 7^x = \log 83$

$x \log 7 = \log 83$

$x = \frac{\log 83}{\log 7}$

$x = 2.27$

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Solve to the nearest hundredth.

1. $5^x = 38$

$\log 5^x = \log 38$

$x \log 5 = \log 38$

$x = \frac{\log 38}{\log 5}$

$x \approx 2.26$

2. $3^{2x} = 108$

$2x \log 3 = \log 108$

$x = \frac{\log 108}{2 \log 3} = 2.13$

3. $6^{x+3} = 50$

$(x+3)\log 6 = \log 50$

$x + 3 = \frac{\log 50}{\log 6}$

$x = \frac{\log 50}{\log 6} - 3 = -.82$

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4. $5 - 3^x = -40$

$-5 \quad -5$

$-3^x = -45$

$-1 \quad -1$

$3^x = 45$

$x \log 3 = \log 45$

$x = \frac{\log 45}{\log 3} \approx 3.46$

5. $4(2)^x - 3 = 17$

$+3 \quad +3$

$\frac{4(2)^x}{4} = \frac{20}{4}$

$2^x = 5$

$x \log 2 = \log 5$

$x = \frac{\log 5}{\log 2} \approx 2.32$

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You could also consider changing the equations above to logarithmic form to solve for x. Let's redo questions 1-5 using this method.

Step 1: Isolate the expression containing the exponent, if needed. Change to logarithmic form.

Step 2: Use the log base function on your calculator to evaluate. $y = \log_b a \leftrightarrow b^y = a$

1. $5^x = 38$

$x = \log_5 38$

$x \approx 2.26$

2. $3^{2x} = 108$

$\frac{2x}{2} = \frac{\log_3 108}{2}$

$x = \frac{\log_3 108}{2} = 2.13$

3. $6^{x+3} = 50$

$x + 3 = \log_6 50$

$x = \log_6 50 - 3 \approx -.82$

4. $5 - 3^x = -40$

$5 + 40 = 3^x$

$45 = 3^x$

$x = \log_3 45 \approx 3.46$

5. $4(2)^x - 3 = 17$

$\frac{4(2)^x}{4} = \frac{20}{4}$

$2^x = 5 \rightarrow x = \log_2 5 \approx 2.32$

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