HAT
Logarithm Properties

11/27/17

Warm Up: Solve for x.

$$\log_2 4 + \log_2 8 = \log_2 x$$

$2 + 3 = \log_2 x$

$5 = \log_2 x$

$2^5 = x$

$x = 32$

$$\log_3 27 - \log_3 9 = \log_3 x$$

$3 - 2 =$

$1 = \log_3 x$

$3^1 = x$

$x = 3$

$$x \cdot \log_2 4 = \log_2 16$$

$x \cdot 2 = 4$

$x = 2$

Sometimes there is a benefit to using log properties to expand or condense an expression.

Product Property: $\log_a(m \cdot n) = \log_a m + \log_a n$

$\log_2 4 + \log_2 8 = \log_2 4 \cdot 8 = \log_2 32$

Quotient Property: $\log_a \frac{m}{n} = \log_a m - \log_a n$

$\log_3 27 - \log_3 9 = \log_3 \left(\frac{27}{9}\right) = \log_3 3$

Power Property: $\log_a m^n = n \log_a m$

$\log_2 16 = \log_2 4^2 = 2 \cdot \log_2 4$

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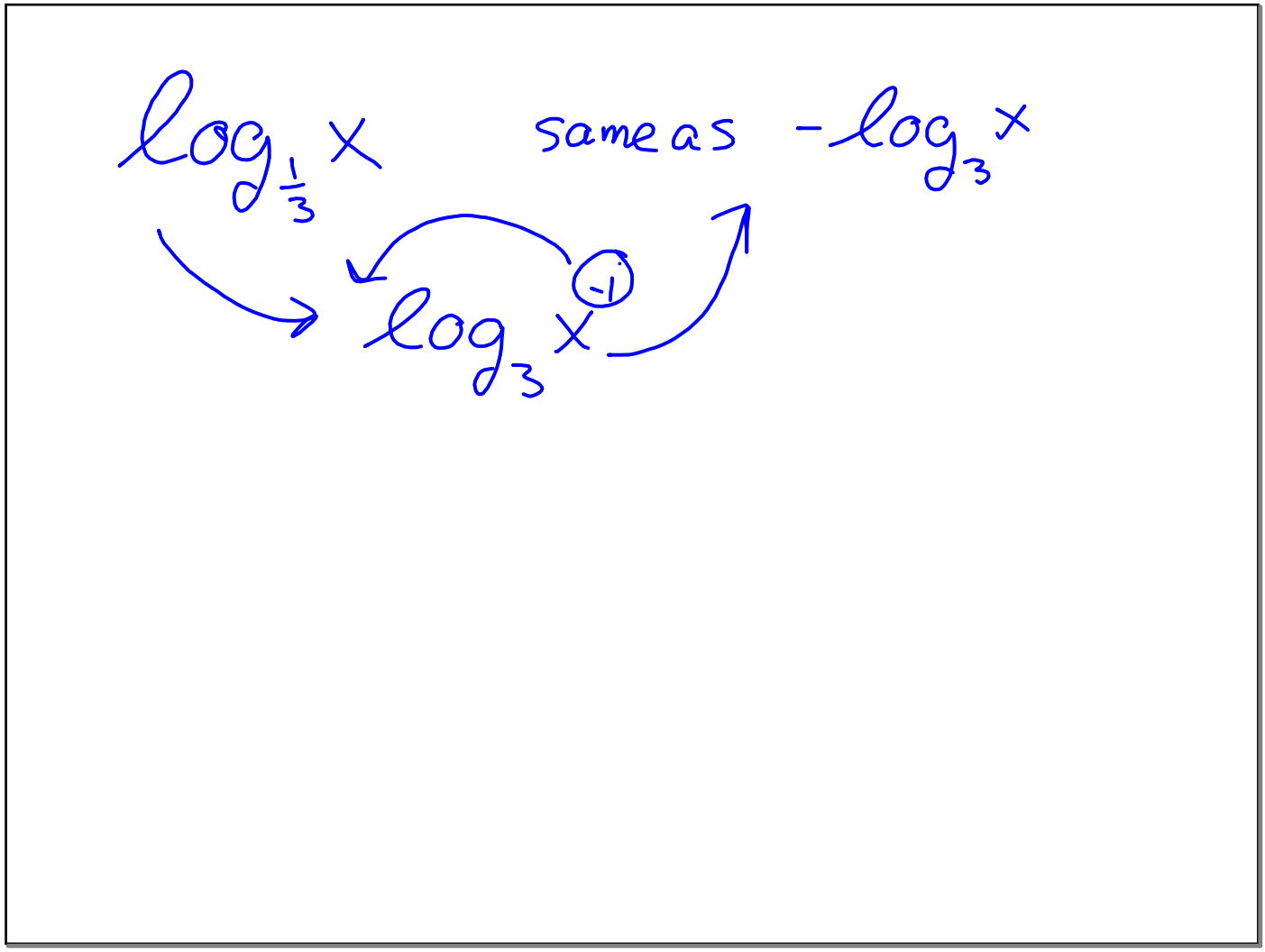

(NC) Simplify using the log properties. Do not use a calculator.

a. $\log_6 2 + \log_6 3$

$\log_6 6$

$\log_6 6 = 1$

b. $\log_{10} 5 + \log_{10} 20$

$\log_{10} 100$

$\log_{10} 100 = 2$

c. $\log_5 200 - \log_5 8$

$\log_5 25$

$\log_5 25 = 2$

d. $\log_5 15 - \log_5 3$

$\log_5 5$

$\log_5 5 = 1$

(NC) Use $\log_2 3 = 1.585$ and $\log_2 7 = 2.807$ to evaluate each expression.

a. $\log_2 49 =$

$\log_2 7^2$

$2 \cdot \log_2 7$

$2 \cdot 2.807$

5.614

b. $\log_2 27 =$

$\log_2 3^3$

$3 \cdot \log_2 3$

$3 \cdot 1.585 = 4.755$

c. $\log_2 \frac{7}{3} =$

$\log_2 7 - \log_2 3$

d. $\log_2 36 =$

$\log_2 4 + \log_2 9$

$2 + 2\log_2 3$

e. $\log_2 0.75 =$

$\log_2 \frac{3}{4}$

$\log_2 3 - \log_2 4$

$\log_2 3 - 2$

f. $\log_2 \frac{7}{16} =$

$\log_2 7 - \log_2 2^4$

$\log_2 7 - 4$

Expand the logarithmic expression.

a. $\log_3\left(\frac{7}{x}\right)$

$\log_3 7 - \log_3 x$

b. $\log_6\left(x^2y^3\right)$

$\log_6 x^2 + \log_6 y^3$

$2\log_6 x + 3\log_6 y$

c. $\log\left(\frac{\sqrt{x}y^2}{z}\right)$

$\log_{10} x^{\frac{1}{2}} \cdot y^2 - \log_{10} z$

$\log x^{\frac{1}{2}} + \log y^2 - \log z$

$\frac{1}{2}\log x + 2\log y - \log z$

Solve each of the following. Do not use a calculator.

a. $\log_2 5 + \log_2 x = \log_2 35$

$\log_2 5x = \log_2 35$

$5x = 35$

$x = 7$

b. $\log_9 24 - \log_9 (x+2) = \log_9 3$

$\log_9 24 - \log_9 3 = \log_9 (x+2)$

$\log_9 8 = \log_9 (x+2)$

$8 = x+2$

$6 = x$

c. $\log_6 (x^2 - 4) + \log_6 3 = \log_6 36$

$\log_6 (x^2-4) = \log_6 12$

$x^2 - 4 = 12$

$x^2 = 16$

$x = \pm 4$

d. $\log_7 (x) + \log_7 (x-1) = \log_7 12$

$\log_7 (x^2 - x) = \log_7 12$

$x^2 - x = 12$

$x^2 - x - 12 = 0$

Assignment:

pg. 488 #25, 26, 29, 30, 33, 34, 37, 46, 47, 49, 51, 57, 58