**Review 13.1-13.2** REVIEW

**Name** Key

**Date** ______________ **Hour** ______

**1.** Arrange the given terms to create a true exponential equation and a true logarithmic equation.

| **Numbers** | **Exponential Form** | **Logarithmic Form** |
|---|---|---|
| a) **16, 2, 4** | $4^2=16$ or $2^4=16$ | $\log_2 16 = 4$ $\log_4 16 = 2$ |
| b) **3, 27, 3** | $3^3=27$ | $\log_3 27 = 3$ |
| c) **2, -2, $\frac{1}{4}$** | $2^{-2}=\frac{1}{4}$ | $\log_2\left(\frac{1}{4}\right) = -2$ |
| d) **3, $\frac{1}{81}$, -4** | $3^{-4}=\frac{1}{81}$ | $\log_3\left(\frac{1}{81}\right) = -4$ |

**2.** Rewrite the following logarithmic equation as a corresponding exponential equation.

**a.** $\log_6 36 = 2$ **b.** $x = \log_4 16$

**a.** $6^2 = 36$

**b.** $4^x = 16$

Rewrite the following exponential equation as a corresponding logarithmic equation.

**a.** $81 = 3^4$ **b.** $8^5 = r$

**a.** $\log_3 81 = 4$

**b.** $\log_8 r = 5$

**3.** Consider the logarithmic equation $\log_8 32 = n$.

**a.** Identify the base, the argument, and the exponent in this equation.

a) Base: 8

Argument: 32

Exponent: n

**b.** Rewrite the equation in exponential form.

b) Exponential Form: $8^n = 32$

**c.** Solve the equation.

$2^{3n} = 2^5$

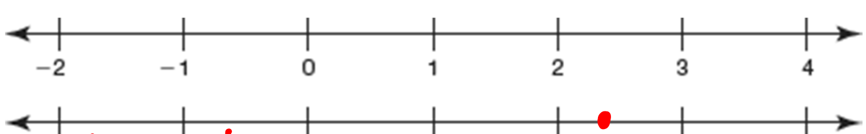
$3n = 5$

$n = 5/3$

c) n = 5/3

**4.** A number line can be used to help you to estimate logarithms.

**a.** Complete the number line using logarithms with base 5.




$\log_5 \frac{1}{25}$ $\log_5 \frac{1}{5}$ $\log_5 1$ $\log_5 5$ $\log_5 25$ $\log_5 125$ $\log_5 625$

**b.** Use the number line to locate $\log_5 50$ between two consecutive integers. Explain your reasoning.

$\boxed{2 < \log_5 50 < 3}$, since $\log_5 25 = 2$, $\log_5 125 = 3$

**5.** Estimate the two consecutive integer values the logarithm is between. Explain your reasoning.

**a.** $\log_2 \frac{1}{3}$ **b.** $\log_3 72$ **c.** $\log_6 40$ **d.** $\log_4 \frac{1}{8}$

$\boxed{-2 < \log_2 \frac{1}{3} < -1}$ $\log_2 \frac{1}{4}$ $\frac{3}{12} < \frac{4}{12} < \frac{6}{12}$ $\log_2 \frac{1}{2}$

$\boxed{3 < \log_3 72 < 4}$ $\log_3 27$ $\log_3 81$

$2 < \log_6 40 < 3$ $\log_6 36$ $\log_6 216$

$-2 < \log_4 \frac{1}{8} < -1$ $\log_4 \frac{1}{16}$ $\log_4 \frac{1}{4}$ $\frac{1}{16} < \frac{2}{16} < \frac{4}{16}$

**6.** **Write an example of each property of the properties below:** Answers may vary

Power Property $4\log_2 y = \log_2 y^4$

Quotient Property $\ln \frac{5}{y} = \ln 5 - \ln y$

Product Property $\log x + \log y = \log(xy)$

**7.** Use properties of logarithms to expand the following expressions.

**a.** $\log_2 \frac{x}{5}$ $\log_2 x - \log_2 5$ Quotient Property

**b.** $\log_4 3x^2$ $\log_4 3 + 2\log_4 x$ Product and Power Properties

**c.** $\log_5 x^2y^3$ $2\log_5 x + 3\log_5 y$ Power and Product Properties

d. $\log_6 \left(\frac{2x^3}{y^2}\right)$ $\log_6 2 + 3\log_6 x - 2\log_6 y$ Product, Power and

**e.** $\log_7 \left(\frac{2xy}{z}\right)^3$ $3(\log_7 2 + \log_7 x + \log_7 y - \log_7 z)$ Power, Product and

**8.** Use properties of logarithms to write each logarithmic expression as a single logarithm.

**a.** $\log_2 3 + \log_2 7$ **a.** $\log_2 21$

**b.** $\log 5 - 3\log 2$ $= \log \frac{5}{2^3}$ **b.** $\log\left(\frac{5}{8}\right)$

**c.** $\ln 6 + \ln 3 - \ln 2$ $\ln \frac{6 \cdot 3}{2}$ **c.** $\ln 9$

**d.** $\mathbf{3(\ln 4 - \ln p) + 2(\ln p - \ln 2)}$ $\ln\left(\frac{4}{p}\right)^3 + \ln\left(\frac{p}{2}\right)^2$ $\ln\left(\frac{64}{p^3} \cdot \frac{p^2}{4}\right)$ d. $\ln\left(\frac{16}{p}\right)$

e. $2\log 5 + 3\log x - 4\log 2$ $\log(5^2x^3/2^4)$ e. $\log\left(\frac{25x^3}{16}\right)$

Solve the exponential equation by using equivalent bases.

**9.** **a.** $2^{2x-1} = 8$

$2^{2x-1} = 2^3$

$2x-1=3$ $2x=4$

**b.** $9^{4x-1} = 27$

$3^{2(4x-1)} = 3^3$

$8x-2=3$

$8x=5$

**9a.** x = $2$

**b.** x = $5/8$

Rewrite the equation in exponential form and solve for the unknown.

**10.** **a.** $\log_4 n = 3$

$4^3 = n$

**b.** $\log n = -3$

$10^{-3} = n$

**10a.** n = $64$

**b.** n = $\frac{1}{1000}$

**11.** **a.** $\log_3 81 = n$

$3^n = 81$

$3^n = 3^4$

$n=4$

b. $\log_n 8 = 3$

$n^3 = 8$

$n^3 = 2^3$

$n=2$

**11a.** n = $4$

**b.** n = $2$

**12.** Consider the logarithmic equation $\log_3(x-4) + \log_3(x+4) = 2$ Solve for the unknown, Use properties of logarithms to condense the left side first.

$\log_3(x^2-16) = 2$

$3^2 = x^2 - 16$

$9 = x^2 - 16$

$25 = x^2$

$\pm 5 = x$

$\boxed{x=5}$