Name:	Date:	Period:

5.3 Intro to Logarithms Notes

Inverse operations	We use inverse operations to solve equations for a variable. Example: Solve $x^2 = 4$ What inverse operation of squaring would be used to solve for x? square root
What is a Logarithm?	A logarithm (log) is an exponent. An equation in logarithmic form is equivalent to another equation in exponential form. n=power (result obtained by raising b to the power of a) exponent $\log_b n = a$ and $b^a = n$ b=base a=exponent Base
Converting Exponent→Log	**Directions:** Write each equation in log form. 1. $3^4 = 81$ base of exponent is 3 $\log_3 81 = 4$ 2. $12^1 = 12$ exponent $\log_{12} 12 = 1$ 3. $2^{-3} = \frac{1}{8}$ $\log_2 (\frac{1}{8}) = -3$ 4. $8^{\frac{4}{3}} = 16$ $\log_8 16 = \frac{4}{3}$

rewriting is needed to solve exponential and log equations for a variable.

Converting Log→Exponent	**Directions:** Write each equation in exponential form.	
	5. $\log_3 9 = 2$ $3^2 = 9$	6. $\log_7 1 = 0$ $7^0 = 1$
	7. $\log_4 \frac{1}{16} = -2$ $4^{-2} = \frac{1}{16}$	8. $\log_9 27 = \frac{3}{2}$ $9^{3/2} = 27$
The Common Logarithm	A logarithm with base 10 is called a **common logarithm** and can be written without the base. $\log_{10} a \longrightarrow$ log a	
Evaluating Logs (change base of argument – what is being taken the log of)	$\log_b(b^n) = n$ ← argument Example: $\log_3 3^2$ 2	Justification: $\log_3 3^2 = ?$ rewrite $3^? = 3^2$ $? = 2$
Evaluating Logarithms	**Directions:** Use your knowledge of exponents to evaluate the following logarithms.	
	1. $\log_7 49$ $\log_7 (7)^2$ 2	2. $\log 100$ base 10 - no base shown $\log_{10}(10^2)$ 2
	3. $\log_{12} 1$ $\log_{12} 12^0$ 0 any power with expo of 0 is = to 1	4. $\log_9 \frac{1}{81}$ $\log_9 (9^{-2})$ -2

Change of Base Formula (of the log)

common log Key on most calculators.

Some logarithms are not as easy to evaluate as those above, so we have the **change of base formula.**

Logarithm Change of Base Formula

$$\log_a(b) = \frac{\log_c(b)}{\log_c(a)}$$

c is the new log base

change the $\log_a$ to a common log below.

Directions: Evaluate each log using the change of base formula. Round to the thousandths place. 0.000←

1. $\log_{16} 64$ $\log_{16} 64 \Rightarrow \frac{\log 64}{\log 16}$ 1.500	2. $\log_2 54$ $\frac{\log 54}{\log 2}$ $\approx$ 5.755
3. $\log_4 136$ $\frac{\log 136}{\log 4}$ $\approx$ 3.544	4. $\log 294$ log 294 Already base 10. Use calc. button. You could change to another base $\approx$ 2.468