Math 3 Unit 9 **Name:_____**
Logarithm Rules Activity **Date:_____Period:_____**

Part I: Evaluate these expressions using your understanding of logs:

1) $\log_2(8) + \log_2(4) =$ ____ which is the same as $\log_2(\_\_\_)$

2) $\log_3(27) + \log_3(3) =$ ____ which is the same as $\log_3(\_\_\_)$

3) $\log_4(4) + \log_4(16) =$ ____ which is the same as $\log_4(\_\_\_)$

4) $\log_5(5) + \log_5(1) =$ ____ which is the same as $\log_5(\_\_\_)$

5) What pattern seems to hold? Write a rule: $\log_b X + \log_b Y = \log_b(\_\_\_\_)$

Use the new rule to solve some problems that were impossible before:

6) $\log_6 12 + \log_6 3$ 7) $\log 250 + \log 40$ 8) $\log_8\left(\frac{3}{64}\right) + \log_8\left(\frac{1}{3}\right)$

Part II: Evaluate these expressions using your understanding of logs:

1) $\log_5(125) - \log_5(5) =$ ____ which is the same as $\log_5(\_\_\_)$

2) $\log_2(32) - \log_2(8) =$ ____ which is the same as $\log_2(\_\_\_)$

3) $\log_3(81) - \log_3(3) =$ ____ which is the same as $\log_3(\_\_\_)$

4) $\log_4(64) - \log_4(16) =$ ____ which is the same as $\log_4(\_\_\_)$

5) What pattern seems to hold? Write a rule: $\log_b X - \log_b Y = \log_b(\_\_\_\_)$

Use the new rule to solve some problems that were impossible before:

6) $\log_6 72 - \log_6 2$ 7) $\log 12 - \log 0.12$ 8) $\log_{12} 2 - \log_{12} 288$

Part III: Evaluate these expressions using your understanding of logs:

1) $\log_2(4^3)$ = ____ which is the same as ___ • $\log_2 4$

2) $\log_3(9^2)$ = ____ which is the same as ___ • $\log_3 9$

3) $\log_5(25^2)$ = ____ which is the same as ___ • $\log_5 25$

4) $\log_7(7^{-2})$ = ____ which is the same as ___ • $\log_7 7$

5) What pattern seems to hold? Write a rule: $\log_b(X^c) =$

Use the new rule to solve some problems that were impossible before:

6) $\log_3(9^{250})$ 7) $\log_n(n^y)$ 8) $\log\sqrt{1000}$

Part IV: Combining the three rules together: Recall that

$\log_b(XY) =$	and	$\log_b X + \log_b Y =$
$\log_b\left(\frac{X}{Y}\right) =$	and	$\log_b X - \log_b Y =$
$\log_b(X^c) =$	and	$c \bullet \log_b X =$

1) Write three different expressions, using each rule once, that are all equivalent to log 8.

log 8 = log (__•__) = log( ) + log( ) log 8 = log $\left(\frac{\ }{\ }\right)$ = log( ) – log( ) log 8 = log( ) = ___•log( )

Expand each logarithm:

2) log (ac) 3) $\ln\left(\frac{c}{b}\right)$ 4) $\log\left(\frac{\sqrt{a}}{c^2}\right)$ 5) $\ln\left(\frac{a^4\sqrt{b}}{c^5}\right)$

Express as a single logarithm

6) 2 log b + 3 log c 7) 2 log a – 4 log b 8) $\frac{1}{2}$ ln a + 2 ln c – ln b

9) Express as a single logarithm and evaluate: $2\log_3 6 + 4\log_3 2 - 2\log_3 8$

10) If log 4 = m and log 6 = n, then evaluate: a) log 24 b) log $\frac{3}{2}$ c) log 2