**Activity 5.1.5 The Power Rule for Logarithms**

1. has been rewritten below. Justify each step.

1. Using the Product Rule for Logarithms, rewrite justifying each step.
2. Using the Product Rule for Logarithms, rewrite , justifying each step.

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1. Using the Product Rule for Logarithms, rewrite , where is a natural number, justifying each step.

 You have stated the Power Rule for Logarithms.

1. Use Proof by Counter Example to show that Hint: Choose values for .
2. The general power rule is for any real number . Use the law to help rewrite the following.
3. log*b*0.001
4. Using the general power rule, rewrite the following.
5. Now be prepared to use all your rules. Find an equivalent expression for each expression below using properties of logarithms. Aim for new expressions that are “simpler” than the ones given below.
6. log x + log x3 + log x5
7. log x + log √x – log 5
8. log3 27 + log3 27
9. Find an equivalent expression for each expression properties of logarithms. Your new expressions may not appear to be “simpler.” They may appear to be expanded.
10. log2 (10x)
11. log (x5y7)
12. You have a Product Rule, Quotient Rule and Power Rule for Logarithms. Is there a Sum Rule? Does the log (a + b) = log a + log b? Justify your answer.
13. Below are four more possible properties or rules for logarithms. Decide if each statement is always true. If it is not, provide a counterexample.
14. log(a – b) = log a – log b
15. log(ab) = (log a)(log b)
16. log(a/b) = (log a)/(log b)
17. log(1/a) = 1/(log a)
18. A common error is to write log (10x3) = 3 log (10x). If a student writes this, what mistake is he making? How can you correctly rewrite log(10x3)?
19. When evaluating the log of a quotient using technology use care. The parentheses in log (87/4) may be essential. Does your calculator give you the answer for (log 87)/4 or log (87/4) if you do not put in the parentheses? \_\_\_\_\_\_\_ Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
20. A. In Algebra 1 you considered a problem such as “Jose invested $7000 in a compound interest account with a yearly interest rate of 4%. When will he have $14000?” In Algebra 1 you used trial and error to find an approximate answer. Do so again now.\_\_\_\_\_\_ You hopefully are finding by trial and error the value of t that will satisfy the equation 2 = 1.04t.

B. Now use the Power Rule to rewrite the equation as log 2 = t log 1.04 and now solve for t. How close are your answers? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

We will continue to expand our ability to solve equations that need the Power Rule in our next activity.