GUIDED NOTES – 6.5 LOGARITHMIC PROPERTIES

LEARNING OBJECTIVES

In this section, you will:

- Use the product rule for logarithms.
- Use the quotient rule for logarithms.
- Use the power rule for logarithms.
- Expand logarithmic expressions.
- Condense logarithmic expressions.
- Use the change of base formula for logarithms.

USING THE PRODUCT RULE FOR LOGARITHMS

- Recall that the logarithmic and exponential functions "undo" each other. This means they have similar properties. Some important properties are:
 - $\log_b(1) =$ _____
 - $\log_b(b) =$ _____
 - Inverse property:

$$\log_b(b^x) =$$
_____ and $b^{\log_b(x)} =$ _____, $x > 0$

• One-to-One property:

$$\log_b M = \log_b N$$
 if and only if $M = N$

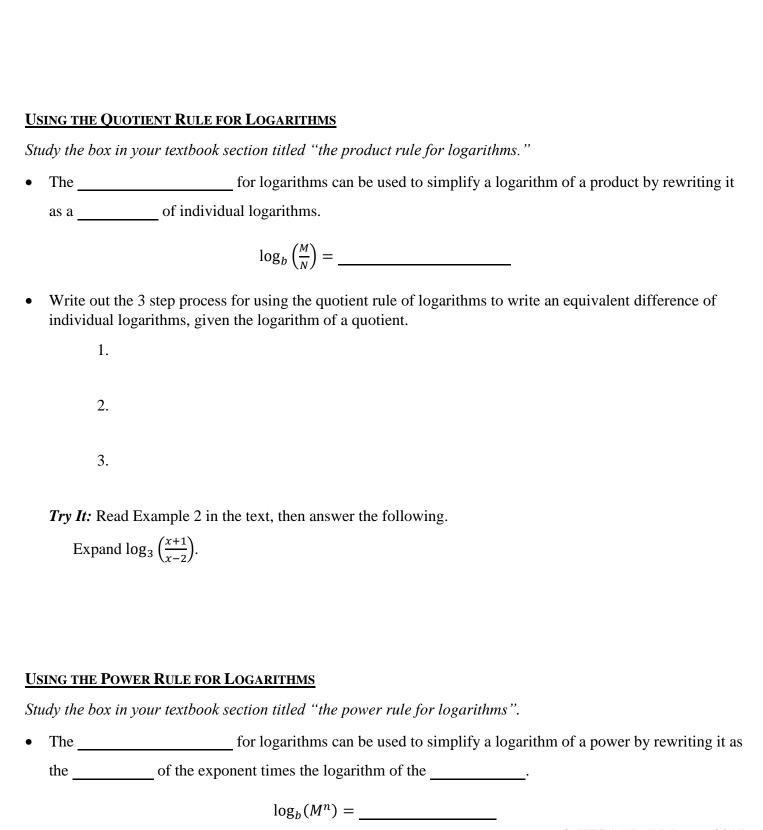
Study the box in your textbook section titled "the product rule for logarithms".

• The _____ for logarithms can be used to simplify a logarithm of a product by rewriting it as a _____ of individual logarithms.

$$\log_b(MN) = \underline{\hspace{1cm}} \text{for } b > 0$$

- Write out the 2 step process for using the product rule of logarithms to write an equivalent sum of individual logarithms, given the logarithm of a product.
 - 1.

2.



Try It: Read Example 1 in the text, then answer the following.

Expand $\log_b(8k)$.

•	Write out the 2 step process for using the power rule of logarithms to write an equivalent product of a factor and a logarithm, given the logarithm of a power.
	1.
	2.

Try It: Read Example 3 in the text, then answer the following. Expand $ln(x^2)$.

Try It: Read Example 4 in the text, then answer the following. Expand $\ln\left(\frac{1}{x^2}\right)$.

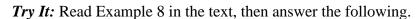
Homework: You should now be ready to attempt problems 1-2 in "Homework – Section 6.5" on WeBWorK.

EXPANDING LOGARITHMIC EXPRESSIONS

Try It: Read Example 6 in the text, then answer the following.

Expand
$$\log\left(\frac{x^2y^3}{z^4}\right)$$
.

Try It: Read Example 7 in the text, then answer the following. Expand $\ln(\sqrt[3]{x^2})$.



Expand
$$\ln \left(\frac{(x-1)(2x+1)^2}{(x+3)(x-3)} \right)$$
.

Homework: You should now be ready to attempt problems 3-4 in "Homework – Section 6.5" on WeBWorK.

CONDENSING LOGARITHMIC EXPRESSIONS

- Write out the 3 step process for writing an equivalent expression as a single logarithm, given a sum, difference, or product of a logarithm with the same base.
 - 1.
 - 2.
 - 3.

Try It: Read Example 9 in the text, then answer the following.

Condense
$$log(3) - log(4) + log(5) - log(6)$$
.

Try It: Read Example 10 in the text, then answer the following.

Rewrite $\log(5) + 0.5 \log(x) - \log(7x - 1) + 3 \log(x - 1)$ as a single logarithm.

Try It: Read Example 11 in the text, then answer the following.
Condense $4(3\log(x) + \log(x+5) - \log(2x+3))$.
Homework: You should now be ready to attempt problems 5-8 in "Homework – Section 6.5" on WeBWorK.
USING THE CHANGE-OF-BASE FORMULA FOR LOGARITHMS
Study the box in your textbook section titled "the change-of-base formula."
• The change-of-base formula can be used to evaluate a logarithm with any For any positive
real numbers M , b , and n , where $n \neq 1$ and $b \neq 1$,
$\log_b M = \underline{\hspace{1cm}}$
• Write out the 2 step process for using the change-of-base formula to rewrite a logarithm as a quotient of logs with any positive base n , where $n \neq 1$, given a logarithm with the form $\log_b(M)$.
1.
2.
a.
b.
<i>Try It:</i> Read Example 13 in the text, then answer the following. Change $\log_{0.5}(8)$ to a quotient of natural logarithms.