MA 103 CHAPTER 9: SECTION 9.4 PROPERTIES OF LOGARITHMS

In Section 9.2 we discovered that for $b > 0$ and $b \neq 1$, and $a > 0$.

1. $\log_b b = 1$

2. $\log_b 1 = 0$

3. $\log_b (a) = c$ is equivalent to $b^c = a$

4. WRITE THE EXPONENTIAL FORM FOR

   A. $\log_4 64 = 3$

   B. $\log_k m = n$

5. WRITE THE LOGARITHMIC FORM FOR

   A. $3^2 = 9$

   B. $p^q = r$

6. POWER PROPERTY FOR LOGARITHMS

   A. Does $\log_3 3^2 = 2 \log_3 3$?

   B. Does $\log_7 7^4 = 4 \log_7 7$?

   C. Use a calculator table to compare values for $f(x) = \log (x^3)$ and $g(x) = 3 \log (x)$.

   D. Can you guess the power property: $\log (x^p) =$ ________________________?

7. THE COMMON AND NATURAL LOGARITHMS

Note: $\log_2 64 = 6$ while $\log_4 64 = 3$, obviously the answer to a logarithm of a number n will differ depending upon the base of the logarithm. Thus, you can't evaluate $\log_b n$ using any other log base except for b.

Your calculator has two logarithmic buttons:

log for $\log_{10}$ Referred to as the common log

ln for $\log_e$ Referred to as the natural log

(e is an irrational number which can be approximated by e = 2.7183) (p. 239)

$\log(a) = c$ and $10^c = a$ are equivalent

$\ln(a) = c$ and $e^c = a$ are equivalent

Either of these logs can be used to solve exponential equations.

8. USING THE POWER PROPERTY TO SOLVE EXPONENTIAL EQUATIONS:

A. $2^x = 24$

B. $3^{7x+1} + 7 = 50$

C. $5^x + 9 = 40 - 3(5^x)$

D. $20 = -3 + 4(2^x)$

9. MISUSE OF THE POWER PROPERTY

It is true that $\log_b (x^p) = p \log_b (x)$.

Only one of the following statements is true, which one is it?

(1) $\log_b [a(x^p)] = p \log_b (ax)$

(2) $\log_b [(ax)^p] = p \log_b (ax)$

Let b = 10, a = 10, x = 10 and p = 2 and see if the result agrees with your guess.

10. SOLVING LOGARITHMIC EQUATIONS

A. $\log_8 x = 1/3$

B. $\log_5 (4x + 1) = 3$

C. $\log_b (80) = 7$

D. $\log_b (16) = 2$