CHAPTER 5 PRACTICE QUESTIONS

Directions: Complete the following open-ended problems as specified by each question stem. For extra practice after answering each question, try using an alternative method to solve the problem or check your work.

1. Evaluate each of the following without a calculator:

(a) $\log_5 125$

(b) $\log_8 64$

(c) $\log_3 \frac{1}{9}$

(d) $\log_9 9$

(e) $\log \frac{1}{10}$

2. For each of the following, find the inverse function:

(a) $y = \sqrt{3x - 5}$

(b) $f(x) = 16 - x^2, x \geq 0$

(c) $y = \sqrt{9 - x^2}, 0 \leq x \leq 3$

(d) $g(x) = 3 \cdot 8^{-x}$

(e) $h(x) = 4 \cdot 6^{2x} - 8$

3. For each of the following, rewrite using properties of logarithms to express as a sum or difference:

(a) $\log_2 \frac{8x^2\sqrt{z}}{y^3}$

(b) $\ln \frac{\sqrt[3]{4a - 5}}{3b}$

(c) $\ln \sqrt{x^2 \left(x^2 + 2\right)}$

(d) $\log_z \frac{\sqrt{ac}^{\,5}}{b^6}$

4. Graph the function $f(x) = \log_{1/2}(x + 7) - 3$.

5. For each of the following, solve for x without a calculator:

(a) $9^{x+2} = 27^2$

(b) $\log_2 \frac{1}{16} = x^2 - 4x$

(c) $\log_2(x^2 + 12) = \log_2 7x$

(d) $2 \log_5 x = \log_5 9, x > 0$

6. For each of the following, use the properties of logarithms to rewrite the given expressions as a single logarithm:

(a) $\log_5(x^2 - 1) - 6 \log_5(x + 1)$

(b) $\log\left(\frac{x^2 - 2x - 15}{x^2 - 5x}\right) - \log\left(\frac{x^2 + 6x + 9}{x}\right)$

(c) $6\log_3\sqrt{4x - 3} - \log_3\left(\frac{2}{x}\right) + \log_3 9$

(d) $3\log_2\sqrt[3]{a} - c \log_2 b + 2 \log_2(de)$

7. For each of the following, solve for x. Make sure that your solutions do not make any terms in the original equations undefined.

(a) $4^{x+3} = 7^x$

(b) $\ln(x + 5) = \ln(x - 1) - \ln(x + 1)$

(c) $\log_{10}(x^2 + 5x) - \log_{10} x = 2$

(d) $\ln(4x - 3) = \ln 25$

8. A population of fungi grows exponentially. A population that initially has 10,000 grows to 25,000 after 2 hours.

(a) Use the exponential growth function, $A(t) = A_0e^{kt}$ to find the value of k rounded to 2 decimal places. What will be the fungus population after 6 hours?

(b) Write a logarithmic function that gives t as a function of $A(t)$, which we can now write as A.

(c) If a scientist estimates that the fungus population in this sample is 63,000, then how many hours have passed since the initial measure of 10,000 individuals in the population?

9. A certain species of marmoset is listed as vulnerable for its conservation status. There are currently about 8000 of this species, which is 46% of the population 6 years ago, and the decrease in population has been exponential. Let t represent the number of years since 6 years ago (so $t = 6$ represents the current year).

(a) Write an exponential function that gives the population of this marmoset species in a given year, as defined by t. (Use the formula for continuous growth/decay, $A = A_0e^{kt}$, where A is the population after t years, given that the initial population, at $t = 0$, is A_0.)

(b) Rewrite the equation to give t as a function of the population.

(c) If the population drops below 2500, the species will be considered endangered. If the population continues to decrease at the same exponential rate, in how many years will this marmoset species be considered endangered?