Name: _____ Date: _____ **Unit 7 Assessments**

Exponential and Logarithmic Functions Test Review

Directions: Be sure to show all work, communicate your thought process, and justify your reasoning. Remember to check that your answers are complete, correct, and reasonable.

1. A certain savings account accrues simple interest annually, according to a model M(t), which represents the total amount of money saved in the account after t years. An initial deposit of $823 results in M(4) = 862.64. Another account accrues compound interest monthly at a rate of 1.2%. Determine the initial amount you would have to deposit in this account for both accounts to have the same amount of money after seven years.

2. The value of a certain item is initially $1,000, but depreciates at a rate of 87.5% every four years.

a. Write a function V(t) to represent the value, V, of the item after t years, using a positive exponent.

b. How long will it take for the item to be worth less than $10? Round to the nearest year.

c. Rewrite V(t) using a negative exponent.

d. Rewrite V(t) using an integer exponent.

e. Determine the monthly rate of depreciation.

f. Does the rate of change in the item's value increase or decrease over time?

3. Throughout one year, the number of people enrolled in a research program to help find a cure for cancer increased exponentially according to the model $P = P_0(1.34)^t$. Rewrite this equation so that it can be used to model the approximate monthly increase in enrollment.

4. Plutonium-239 decays according to the equation $A = A_0e^{-0.0000288t}$, where time is measured in years. Determine the half-life of plutonium-239 .

5. After appraisal this year, the values of three cars are expected to be modeled by the following functions, where V(t) is the value t years from now (2016).

Car A: $V(t) = 54500e^{0.0123t}$ **Car B:** $V(t) = 75000e^{0.0128t}$ **Car C:** $V(t) = 68500e^{-0.0135t}$

a. Order the cars in terms of their current value, from least to greatest. _____ _____ _____

b. State whether each car's value is expected to increase or depreciate over time.

Car A: Car B: Car C:

c. One car will never be worth more than Car B. Which car is this, and how do you know?

e. For each car, determine when the car will be expected to be worth $200,000 dollars.

f. The value of another car increases by 25% each year. Determine the monthly rate of increase, expressed as a percentage to the nearest tenth.

6. An element decays exponentially according to the function $M(x) = 23.25(.2)^{x/6}$, where x is the time in days. Approximately what percent of the element remains from one **day** to the next?

7. Expand each logarithm.

a. $\log\left(\frac{3s}{r^7 p^2}\right)^5$

b. $\log_3 \sqrt{mn^5}$

c. $\log_5(4s^3\sqrt{k})$

d. $\log_8\left(\frac{7w^9}{j^2 b}\right)$

8. Condense each logarithm.

a. $\log_4(2r) + \frac{1}{2}\log_2(mn) - 5\log_2(8s)$

b. $\log_9(p) - 3\log_9(n) + 0.5\log_9(q)$

9. Evaluate each logarithm.

a. $\log_{1/2} \frac{1}{128}$

b. $\log_8 4096$

c. $\log_8 1$

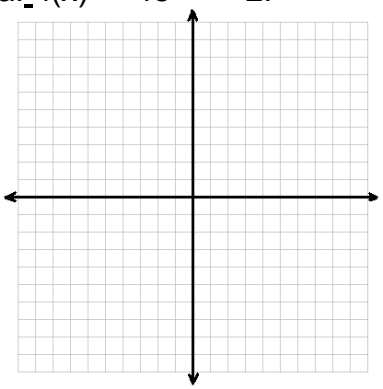
d. $\log_{1/3}(27)$

e. $\log_{256} 2$

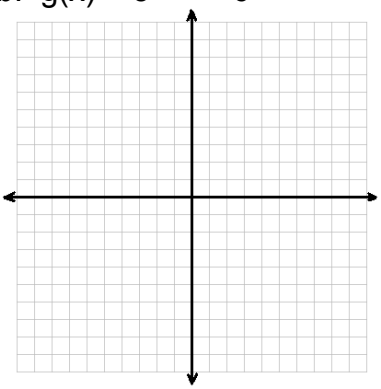
f. $\log_4 4$

10. Graph and state the domain and range and horizontal asymptote for each function.

a. $f(x) = -4e^{x-2} + 2$.



b. $g(x) = 5^{-x+3} - 6$



11. The population of a small town recorded at various years is displayed in the table. Write a function that could be used to model the population t years after 2011. Then determine in which year you may expect the population to exceed 3,000, assuming the trend continues.

Year	Population
2011	1,344
2012	1,479
2013	1,630
2015	1,788

12. Solve each equation for the variable.

a. $\ln(8a + 59) = \ln(-3a - 2)$

b. $\log_7(7b) + \log_7(b) = 3$

c. $5e^{c} = 30$

d. $\ln(4d - 7)^{3} = 18$

e. $5^{3x-3} = 1/625$

f. $12\log_{6}(3y - 12) = 36$

g. $\log_{5}(2p) - \log_{5}6 = \log_{5}54$

h. $\log(3h) + \log(h - 1) = \log(8)$

*Also check the website for more additional (optional) practice with exponential and logarithmic equations and expressions! ☺ [Bonus points will be awarded for completing any of those problems, with all work shown. Focus on the areas that will benefit YOU the most!]