## HW L4-7

Name ______________________

1. The number of employees who attend the weekly webinar series decreases each week after January $1^{st}$. The table shows the weekly attendance according to the number of weeks after January $1^{st}$.

| Weeks after January $1^{st}$ | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Weekly attendance | 228 | 206 | 185 | 163 | 148 |

a. Find the approximate common ratio from week to week. Round to the nearest tenth.

b. Write an equation for $W(t)$, the predicted weekly webinar attendance $t$ weeks after January $1^{st}$ using the initial value and common ratio from the table.

2. An exponential function of the form $f(x) = ab^x$ passes through $(2, 21)$ and $(5, 122.472)$.

a. Find the value of $b$.

b. Find the value of $a$.

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3. Ibuprofen, a pain reliever, is generally taken in $400$ mg dosages. The amount of ibuprofen, $P$ , in milligrams, remaining in the body after $t$ hours it is taken can be modeled by $P(t)=400\left(\frac{1}{2}\right)^{\frac{t}{2}}$ .
Which of the following statements is FALSE?

A) After $24$ hours, there is less than $1$ mg of ibuprofen in the body.

B) Every hour, the amount of mg of ibuprofen in the body decreases by $50\%$ .

C) The half-life of ibuprofen is $2$ hours.

D) After $6$ hours, there are $50$ mg of ibuprofen in the body.

4. The value of the $1^{\text{st}}$ generation iPad can be modeled by the function $V(t) = 499e^{-0.19687t}$, where $V$ is the value in dollars and $t$ is the time in years since it was first released in $2010$.

a. Does this model suggest exponential growth, exponential decay, or neither? Explain.

b. How much was the iPad $1$ worth when it was first released?

c. How much is the iPad $1$ worth in $2022$?

d. According to the model, in what year will the iPad $1$ be worth only $\$20$? Use the graphing feature of your calculator.

5. If a population of initial size $P$ doubles every $12$ days, what will be the population after $6$ days? Write your answer in terms of $P$.

6. A population of seals in the Pacific Northwest can be modeled with the equation $S = 312(1.035)^t$ where $S$ is the number of seals, and $t$ is the number of years since the study of the population began. Which of the following expressions is correctly rewritten to reveal the monthly growth rate of the seal population?

A) $312(1.00287)^{\frac{t}{12}}$

B) $312\left(\frac{1.035}{12}\right)^{12t}$

C) $312(1.51107)^{\frac{t}{12}}$

D) $312(1.00287)^{12t}$

7. Shauna dropped $260$ quarters on the ground. She removed all the quarters that landed on heads and then counted all the quarters that landed on tails. She then picked up all the quarters that landed on tails and dropped them again. She continued the pattern of removing the heads, counting the tails, and then re-dropping all the quarters that landed on tails.

a. How many quarters would you expect to land on tails after the first drop?

b. How many quarters would you expect to land on tails after the second drop? The third drop?

c. Write an equation that can be used to model the number of quarters landing on tails, $T$ , afte $d$ drops.

d. Estimate how many times you think Shauna will have to drop the quarters until no quarters land on heads. Explain your reasoning.

8. The internal temperature of a casserole at the time it is removed from the oven is $190^{\circ}$ Fahrenheit. Five minutes after the casserole is removed from the oven, the temperature is $172^{\circ}$ . Ten minutes after the casserole is removed from the oven, the temperature is $157^{\circ}$ .

a. Assume that the temperature of the casserole decreases exponentially. Estimate the rate of decrease of the temperature of the casserole. Give your answer as a percent per minute.

b. Write an equation in the form $y = ab^x$ that could be used to model the temperature of the casserole, $y$ in $^{\circ}F$ , $x$ minutes after it is removed from the oven.

c. Do you think your model could be used to reasonably predict the temperature of the casserole after $2$ hours ( $x = 120$ )? Why or why not?

d. Describe the benefits and limitations of your model.

9. An element is known to decay at a rate of $35\%$ every $4$ days. If after $8$ days there are $65$ grams of the element remaining, how much of the element must there have been on day $0$ ? Round to the nearest whole gram.