Lesson 3.06 Modeling and Solving Exponential Word Problems (Mixed Review)

Students will be able to:

- Content Objective: Model and solve compound interest word problems.
- Language Objective: Explain how the solution to an exponential equation relates to it's graph.

Warm Up

A local public school has a current enrollment of $4{,}000$ students. The enrollment is increasing continuously at a rate of 3.5% each year. Which logarithm is equal to the number of years it will take for the population to double?

(1) $\frac{\ln(2)}{0.35}$

(2) $\frac{\ln(2)}{0.035}$

(3) $\frac{\ln(8{,}000)}{0.035}$

(4) $\frac{\ln(2)}{3.5}$

This lesson is mixed review, therefore there are no skills and only exercises.

Exercise 1: Continuous Growth Rate

A population of 850 bacteria grow continuously at a rate of 3.85% per day.

a. Write an exponential function, $b(t)$ that represents the bacterial population after t days and explain the reason for your choice of base.

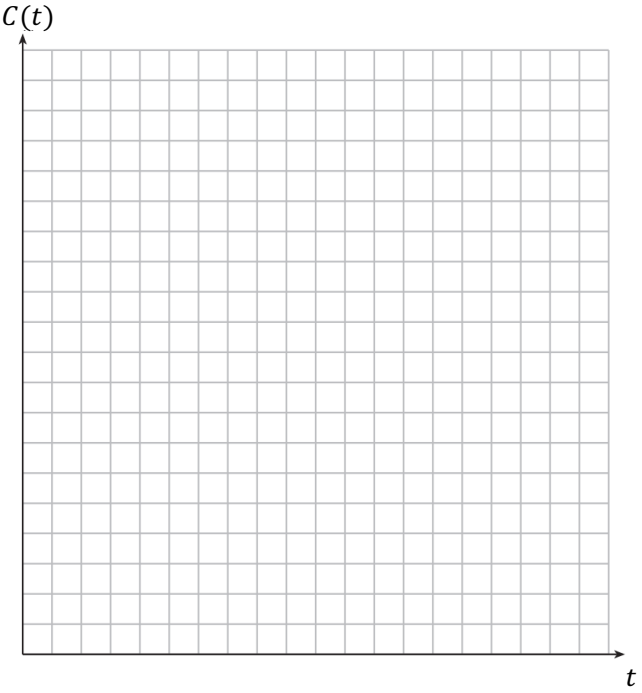
b. Determine the bacterial population after 60 hours, to the nearest bacterium.

Exercise 2: Compound Interest & Graphing

Carissa is evaluating her retirement savings and currently has $\$72{,}000$ in her account. The account earns an interest rate of 6% compounded annually. She wants to determine how much money will be in her account in the future if she makes no additional contributions to the account.

a. Write a function $C(t)$, to represent the amount of money that will be in her account in t years.

b. Graph $C(t)$ where $0 \leq t \leq 16$ on the set of axes below.



c. Carissa's goal is to save $\$180{,}000$. Determine algebraically, to the nearest year, how many years it will take for her to achieve her goal?

d. Explain how your answer to part c. relates to the graph.

Exercise 3: Time Adjustment

Last year, the total revenue for Bake N Bites, a restaurant chain, increased 4.25% over the previous year.

a. **Multiple Choice.** If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let m represent months.]

(1) $(1.0425)^m$ (3) $(1.0035)^m$

(2) $(1.0425)^{\frac{12}{m}}$ (4) $(1.0035)^{\frac{m}{12}}$

b. Algebraically determine how long, in months, it will take for the total revenue to double. Round to the nearest month.

3.06- Problem Set

Name: _____

1. Steven wants to start a college fund for his daughter Elisa. He puts $\$50{,}000$ into an account that grows at a rate of 2.34% per year, compounded monthly.

   a. Write a function, $S(t)$, that represents the amount of money in the account t years after the account was opened, given that no more money was deposited or withdrawn from the account.

   b. Calculate algebraically the number of years it will take for the account to reach $\$150{,}000$, to the *nearest hundredth of a year*.

2. Determine, to the nearest tenth of a year, how long it would take an investment to double at a $3\frac{1}{4}\%$ interest rate, compounded continuously.

3. A population of 600 bacteria grow continuously at a rate of 2.95% per day.

a. Write an exponential function, $b(t)$ that represents the bacterial population after t days and explain the reason for your choice of base.

b. Determine the bacterial population after 45 hours, to the nearest bacterium.