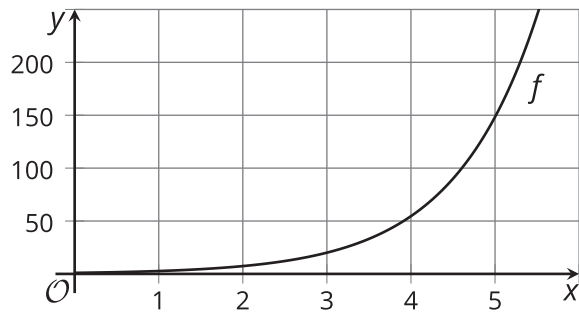


Unit 4 Lesson 15: Using Graphs and Logarithms to Solve Problems (Part 1)

1 Using a Graph to Estimate (Warm up)

Student Task Statement



Here is a graph that represents an exponential function with base e , defined by $f(x) = e^x$.

1. Explain how to use the graph to estimate logarithms such as $\ln 100$.
2. Use the graph to estimate $\ln 100$.
3. How can you use a calculator to check your estimate? What would you enter into the calculator?

2 Retire A Millionaire?

Student Task Statement

The expression $1 \cdot e^{(0.06t)}$ models the balance, in thousands of dollars, of an account t years after the account was opened.

1. What is the account balance:
 - a. when the account is opened?
 - b. after 1 year?
 - c. after 2 years?
2. Diego says that the expression $\ln 5$ represents the time, in years, when the account will have 5 thousand dollars. Do you agree? Explain your reasoning.
3. Suppose you opened this account at the beginning of this year. Assume that you deposit no additional money and withdraw nothing from the account. Will the account balance reach \$1,000,000 and make you a millionaire by the time you reach retirement? Show your reasoning.

3 Cicada Population

Student Task Statement



A population of cicadas is modeled by a function defined by $f(w) = 250 \cdot e^{(0.5w)}$ where w is the number of weeks since the population was first measured.

1. Explain why solving the equation $500 = 250 \cdot e^{(0.5w)}$ gives the number of weeks it takes for the cicada population to double.
2. How many weeks does it take the cicada population to double? Show your reasoning.
3. Use graphing technology to graph $y = f(w)$ and $y = 100,000$ on the same axes. Explain why we can use the intersection of the two graphs to estimate when the cicada population will reach 100,000.