

8-3 Modeling with Exponential Functions

Part 1: Determine the exponential function that models the situation.

1. Initial value = 5, increasing at a rate of 17% per year.

$$f(t) = 5(1 + 0.17)^t = \boxed{5(1.17)^t}$$

2. Initial value = \$4000, decreasing at a rate of 5.5% per year.

Part 2: Growth and Decay problems—Write the function that represents the situation, then answer the question.

3. The 2000 population of Lehi was 26,000, and was increasing at a rate of 8.5% per year. Predict the population of Lehi in 2015. When will the population reach 100,000?

4. The half-life of Strontium-90 is 28.8 years. How long will it take a 10 gram sample to decay to 1 gram?

t = half-life

$$f(t) = 10(1 - 1/2)^t = 1$$

$$t = 3.32$$

$$3.32 \times 28.8 \text{ yrs} = \boxed{95.6 \text{ years}}$$

5. The George River herd of caribou in Canada was estimated to be about 4,700 in 1954 and grew at an exponential rate. In the exponential growth function $P(t) = P_0 e^{0.154t}$, P_0 is the initial population in 1954, t is the time in years after 1954, and $P(t)$ is the population at time t . Use the function to determine how many years after 1954 it will take the herd to reach 400,000.

Part 3: Money—Write the function that represents the situation, then answer the question.

6. If Hugh invests \$1500 at 4% compounded annually, how much money will he have after 7 years?

$$A(t) = P(1 + \frac{r}{n})^{nt}$$

$$A(t) = 1500(1 + \frac{0.04}{1})^{1 \cdot t}$$

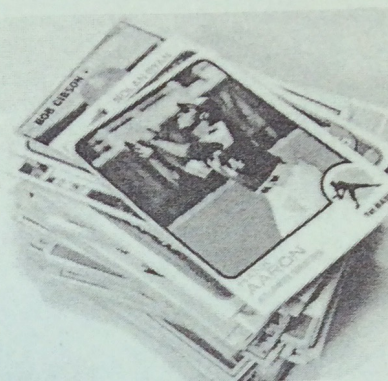
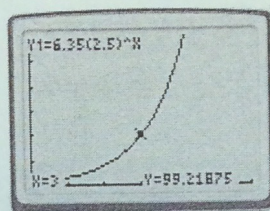
$$A(7) = 1500(1.04)^7 = \boxed{\$1973.90}$$

7. If Bob invests \$2400 at 3.6% compounded annually, how long will it take him to double his money?

8. How much money will you have after 6 years if you invest \$1000 at 5% interest compounded continuously?

$$\text{Hint: } A(t) = Pe^{rt}$$

9. **Explain the Error** A student has a baseball card that is worth \$6.35. He looks up the appreciation rate and finds it to be 2.5% per year. He wants to find how much it will be worth after 3 years. He writes the function $f(t) = 6.35(2.5)^t$ and uses the graph of that function to find the value of the card in 3 years.



According to his graph, his card will be worth about \$99.22 in 3 years.
What did the student do wrong? What is the correct answer?

Hint: Write the equation, then identify what he did wrong.

Review

Find any holes, asymptotes, and intercepts and state the end behavior. Then sketch a graph.

1. $f(x) = \frac{x^2 - 4}{x^2 + 2x - 3}$

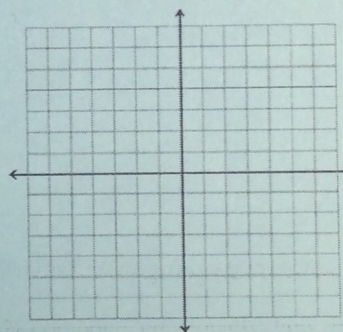
Holes:

VA:

X-int:

y-int:

HA:



2. $g(x) = \frac{x^2 - 5x - 6}{x^2 - 1}$

Holes:

VA:

X-int:

y-int:

HA:

