Alg 2H Exponential Growth and Decay - Applications

1. Suppose that you memorized a list of 200 Spanish vocabulary words. Unfortunately, each week you forgot one-fifth of the words that you knew the previous week.
How many words do you remember after 1 weeks? 2 weeks? 3 weeks?
Write a function which expresses the number of words you remember after x weeks.

2. Population changes between 1970 and 1990 for Missouri are modeled by the equation
$P = 4{,}903{,}000\,(1.0047)^t$ where t=0 corresponds to 1980
Population changes between 1970 and 1990 for Buffalo are modeled by the equation
$P = 1{,}025{,}000\,(0.9918)^t$ where t=0 corresponds to 1980

A) Which represents an increasing population. and how do you know this?
B) Find the population for each for the years 1970, 1980, and 1990
C) Identify the rate of increase or decrease for each.

3. Swiss banks have the reputation of being safe and confidential. Because of the secrecy given to depositors, some accounts *charge* an interest fee instead of *paying* interest. Suppose you deposit $500,000 in a Swiss bank account that charges 2% per year. Write a function that expresses the balance in your account after x years.

4. A population of 800 individuals triples each year. Write a function to express the total population after x years

5. A population of 5200 is decreasing at the rate of 4% per year. Write a funcion to express the total population after x years.

6. Suppose that 10 grams of the plutonium isotope Pu-239 were released in the Chernobyl nuclear accident. (The half-life of Pu-239 is about 25,000 years)
How much of the 10 grams will remain after 1 half-life period? 2 periods 100,000 years? 40,000 years? Write a function which will represent this situation

7. Sunlight produces radioactive carbon (carbon-14), which is absorbed by living plants and animals. Once the plant or animal dies, it stops absorbing carbon-14. Its half life is 5730 years. How much of a 10 gram sample will remain after 4500 years?
Write a function which will represent the situation.

8. In 1985, you bought a sculpture for $380. Each year, t, the value of the sculpture increases by 8%. Write an exponential model to represent this.

9. If a population doubles every 5 years, and it was 3000 in 1985, what will it be in the year 2000? Write a function which would enable you to solve this. Then use the function to find the population in the year 1998.

Chapter 5 Extra Practice Part 2

Tell whether the function represents *exponential growth* or *exponential decay*.

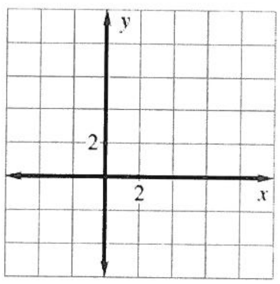
1. $f(x) = \frac{5}{3}\left(\frac{4}{5}\right)^x$

2. $f(x) = \frac{3}{5}\left(\frac{5}{4}\right)^x$

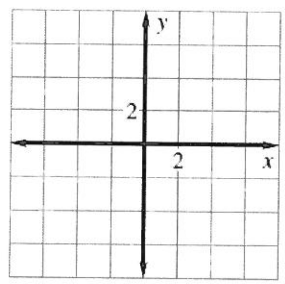
3. $f(x) = 5(2)^{-x}$

Graph the function. State the domain and range.

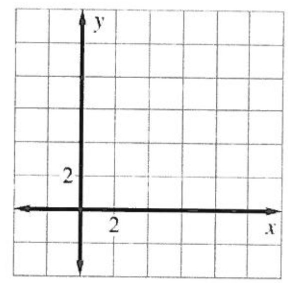
7. $f(x) = \left(\frac{1}{3}\right)^{x+1} + 2$



8. $f(x) = \left(\frac{1}{2}\right)^x - 3$



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



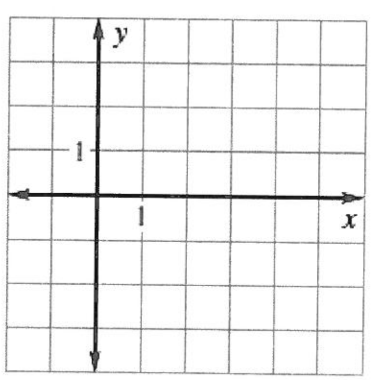
Depreciation You buy a new car for \$22,500. The value of the car decreases by 25% each year.

13. Write an exponential decay model giving the car's value V (in dollars) after t years.

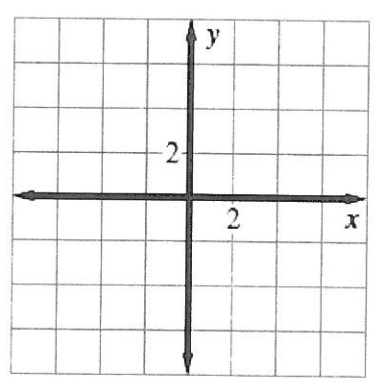
14. What is the value of the car after three years?

15. In approximately how many years is the car worth \$5300?

24. $f(x) = -\log_3 x - 1$



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



Section C

1. Expand the following:

$$\log_6 \frac{xy^2}{\sqrt{z}}$$

2. Condense the following:

$$3 \ln(x + 1) - 2 \ln y + \ln y + \ln 2$$

3. Find the inverse of:

a) $f(x) = \log_6(-x + 2)$

b) $f(x) = 4 \cdot 3^{x-3} + 1$

4. Solve the following equations:

$$\log_6(2x - 6) + \log_6 x = 2$$

$$10^{2x - 3} + 3 = 19$$

Exponential Growth and Decay Problems

5. **Population:** The population of the popular town of Smithville in 2003 was estimated to be 35,000 people with an annual rate of increase (growth) of about 2.4%.

a.) What is the **growth** factor for Smithville?

b.) Write an equation to model future growth.

c.) Use your equation to estimate the population in 2007 to the *nearest hundred people*.

6. **Bacteria Growth:** A certain strain of bacteria that is growing on your kitchen counter doubles every 5 minutes. Assuming that you start with only one bacterium, how many bacteria could be present at the end of 96 minutes?

Condense

7. $$2\ln x - 3\ln y - 4\ln 2 - 5\ln z$$

8. Solve $$\frac{1}{2}(8)^{2x} - 3 = 17$$

Evaluate

9. $$\ln\frac{1}{e^7}$$

Solve

10. $$3e^{2x+1} + 4 = 19$$

Solve

11. $$3\ln(5x) + 6 = 27$$

Evaluate

12. $$\log_x 16 = 4$$