Functions Day 4: Homework
Modeling with Exponential Equations

1. Define a function that expresses each town's population growth in terms of the number of years since the town was established.

     a. Smallsville starts with 500 people and grows by 10 people per year

     b. Growsville starts with 500 people and grows by 10% each year

     c. Shrinktown starts with 500 people and declines by 10% of the population at the end of the previous year

     d. Littletown starts with 500 people and declines by 10 people per year

2. Each function below defines the population for a city in terms of the time (t) in years since the city was established. Write a sentence that describes the city's initial population and growth pattern.

     a. $f(t) = 2000(1.24)^t$

     b. $g(t) = 1500 + 20t$

     c. $h(t) = 4000(0.68)^{2t}$

     d. $r(t) = 2500 - 40t$

     e. $q(t) = 1500(1.4)^{t/2}$

3. You just bought a car for $19,000. It depreciates about 14% a year.
     a. Write an equation that models this situation

     b. How much is the car worth after 1 year?

     c. Is the car worth anything after 50 years?

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4. A biologist counted 426 bees in a bee colony. Her tracking of the colony revealed that the number of bees increased by 4% each month.

    a. Write a function that models this situation.

    b. Approximately how many bees were in the colony 3 years after the initial count?

    c. What was the approximate yearly growth factor?

    d. What was the approximate yearly growth rate?

5. Rabbit populations grow fast! In Hare-ison, PA the rabbit population increases by 15% every month. On January 1, 2015, the rabbit population was 1,000.

    a. What is the monthly growth rate?

    b. Write a formula that expresses the rabbit population for months after January 2015.

    c. How many rabbits will there be after 12 months (1 year)?

    d. What is the annual growth rate?

6. A tire in Lauren's car has just sprung a leak and is losing pressure at a rate of 13% every hour. The tire pressure is currently 250 kilopascals (kP),

    a. Write a formula that expresses the tire pressure for t hours after it starts leaking.

    b. What will Lauren's tire pressure be in 16 hours?

    c. What will her tire pressure be one day from now?

7. In 1995, there were 85 rabbits in Central Park. The population increased by 12% each year.

    a. How many rabbits were in Central Park in 2005?

    b. If the rabbits' population increased by 12% monthly, what would their approximate yearly growth rate be?

    c. If the rabbits' population increased by 12% every six months, what would their approximate yearly growth rate be?

    d. BONUS: If the rabbits' population increased by 12% annually what would their monthly growth rate be? Round to the nearest hundredth percent!