 Name: _____

6.2.D1 ~ Exponential Function Modeling

Past due on: _____ Period: _____

The populations of six towns with time, t (in years), are given by the following equations

$(a)\ P = 1000(1.08)^t$ $(b)\ P = 600(1.12)^t$ $(c)\ P = 2500(0.90)^t$

$(d)\ P = 1200(1.185)^t$ $(e)\ P = 800(0.78)^t$ $(f)\ P = 2000(0.99)^t$

1. Which towns are growing in size?
2. Which town is growing the fastest? What is the annual percent growth rate for that town?
3. Which town is shrinking the fastest? What is the annual percent decay rate for that town?
4. Which town has the largest initial population?
5. Which town will have the smallest population in 4 years?

6. The population of Metroville is 123 thousand and is decreasing by 2.4% each year. Write an exponential function that models the population, P, as a function of the time, t.

7. The population of River City in the year 1910 was 4200. Assume the population increased at a rate of 2.25% per year. Write an exponential function that models the population, P, as a function of the years since 1910, t.

8. In 2006, hotels in Mesa and Chandler, raised room rates by 8.7% over the prior year's rates and still filled more rooms than the year before. The average daily rate of a room in 2005 was $81.77.
   a. To what price did the room rates rise in 2006?
   b. If the room rates continue to rise at 8.7% a year for the next few years, write a function, $R(y)$, to determine the room rate, R, in dollars for a given year, y, since 2005.

9. The number of immigrants coming into the United States increased from 385,000 in 1975 to 1,122,000 in 2005.
   a. Find the annual growth factor; *approximate to 3 decimal places.*
   b. What is the annual growth rate?
   c. Find an exponential model for the number of immigrants, N, as a function of the years since 1975, t.
   d. Use the model to predict the number of immigrants who came into the U.S. in 2016.

10. According to the 2004 Andex Chart, the average return of a $1 investment made in 1925 would have grown to $2641 by 2005.
    a. What is the average annual growth factor? (*Approximate to 3 decimal places.*)

    b. What is the average annual percentage change?
    c. Write an equation for the function $I(y)$, which would model that value of the initial $1 investment, I, as a function of the number of years since 1925, y.

    d. Evaluate $I(90)$ and explain the meaning of the numerical value in the context of the problem.

11. Table 3.7 gives the populations of Austin, Texas and Columbus, Ohio in 1990 and 2000. Assume the population growth is exponential.
    a. Find the change factor for Austin. *If necessary, approximate to three decimal places.*

Table 3.7 Populations of Two Major U.S. Cities

City	1990 Population	2000 Population
Austin, Texas	465,622	656,562
Columbus, Ohio	632,910	711,265

    b. Write an exponential function that models Austin's population, P, as a function of the years since 1990.

    c. According to the model, what is Austin's population today?
    d. Find the change factor for Columbus. *If necessary, approximate to three decimal places.*

    e. Write an exponential function that models Columbus's population, P, as a function of the years since 1990.

    f. According to the model, what is Columbus's population today?
    g. Which city is growing faster?