NOTES: Section 8.7 - Exponential Decay Functions

Goals: #1 - I can write and graph exponential decay functions.







Homework: Section 8.7 Worksheet

Warm Up:

- 1. A family purchased a condo for \$80,000. Each year the value of the condo increases
 - a. Write a model that represents the value of the condo over time.

b. Find the value of the condo after 6 years.

$$A = 80,000 (1.05)^{b}$$

 $A \approx 107,207.05$

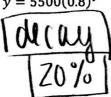
- 2. An initial population of 1000 starfish doubles each year for 4 years.
 - a. Write a model that represents the population of the starfish over time.

b. What is the starfish population after 4 years?

Exploration #1: Tell whether the model is an exponential growth or exponential decay.

1. $y = 17(1.09)^t$

2. $y = 5500(0.8)^t$



3. $y = 80,000(2)^t$



What is the growth/decay rate (%) for each?

Name:	Hour:	Date:

Notes:

Another use of exponential functions to model exponential decay

A quantity is decreasing exponentally if it decreases by the same percentage in each unit of the same percentage.

Exponential $y = C(1-r)^t$

Example #1: You bought a car for \$16,000. You expect the car to lose value, or depreciate, at a rate of 12% per year. Write an exponential decay model to represent this situation.

$$y = ((1-r)^{t})^{t}$$

$$y = ((1-r)^{t})^{t}$$

$$y = (0.12)^{t}$$

$$y = (0.00)(0.88)^{t}$$

a. Using the model, predict the value of the car after 7 years.

$$y = 10,000 (0.88)^{7}$$

 $y \approx 50,538.81$

Example #2: In Lancaster, WI the population of 100,000 people decreases by 2% each year. Write a model to represent this situation.

a. Using the model, predict how many people will live in Lancaster in 20 years.

Name:	Hour:	Date:

You practice:

1. A business earned \$85,000 in 2000. Then its earnings decreased by 2% each year for 10 years.

a. Write a model to represent this situation

$$y = ((1+r)^{\frac{1}{6}} - 85,000 (1-0.02)^{\frac{1}{6}}$$

$$y = 85,000 (0.98)^{\frac{1}{6}}$$

$$y = 85,000 (0.98)^{\frac{1}{6}}$$

b. Using the model, predict how much the business will have earned in 5 years.

2. From 1894 to 1903, the number of miles of cable car track in the United States decreased by about 11% per year. There were 302 miles of track in 1894.

a. Write a model to represent this situation.

$$y = C(1-r)^{t}$$

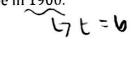
$$(-302)$$

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b. Using this model, predict how many miles of track there will be in 1900.



Notes:

o Keywords: increasing by %, grows, doubles, triples

o Keywords: decreasing by %, depreciates, half

Example #5: At the start of a basketball tournament consisting of six rounds, there are 64 teams. After each round, one half of the remaining teams are eliminated.

- a. Write an exponential decay model. ducy factor: \frac{1}{2}
- b. How many teams remain after 3 rounds?

c. How many teams remain after 5 rounds?

d. Graph the exponential decay of the model using a table:

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