Quiz Exponential Functions 2012 A
(30 pts)

Name Answers

1) Which of the exponential functions below show **growth** and which show **decay**? (1 pt each)

a) $y = 5(0.7)^x$

decay

b) $y = 10(1.5)^x$

growth

c) $y = 10(1+0.12)^x$

growth

2) The population of the city of Appleville, y, is decreasing according to the mathematical model $y = 120,500(.82)^x$, where x is the number of years. (Round all answers to the nearest whole number.) (5 pts)
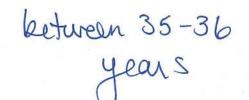
a) What is the starting population of Appleville?

120,500

b) What would the population be in 10 years, if this trend continues?

$$y = 120,500(.82)^{10}$$
$$= 16,562$$

c) Use this model to predict about when the population of Appleville will be about 100 people.

$$y = 120,500(.82)^{35} = 116$$
$$y = 120,500(.82)^{36} = 95$$

between 35-36 years

3) A population of 2000 bacteria is growing at a rate of 15% each day. (4 pts)

a) Write an equation that expresses the number of bacteria at time x.

$$y = 2000(1+.15)^x$$

b) About how many bacteria will there be in 10 days? (Round to nearest whole number.)

$$y = 2000(1.15)^{10}$$
$$= 8091$$

4) Your new car cost $25,000 but it depreciates in value by about 16% each year. (6 pts)

a) Write an equation that would indicate the value of the car at x years.

$$y = 25,000 (1 - .16)^x$$

b) How much will your car be worth in 5 years? (Round to the nearest cent.)

$$y = 25,000 (.84)^5$$
$$= 10,455.30$$

c) About how long will it take before your car is worth close to $1000 dollars, according to your equation? Show your work and/or explain how you arrived at an answer.

$$y = 25000 (.84)^{18}$$
$$= 1083.84$$

$$y = 25000 (.84)^{19}$$
$$= 910.43$$

about 18 years

5) You invest $100,000 in an account with 1.01% interest, compounded quarterly. Assume you don't touch the money or add money other than the earned interest. (4 pts)

a) Write an equation that gives the amount of money, y, in the account after x years.

$$y = 100,000 \left(1 + \frac{.0101}{4}\right)^{4x}$$

b) How much money will you have in the account after 10 years?

$$y = 100,000 \left(1 + \frac{.0101}{4}\right)^{(4 \cdot 10)}$$
$$= 110,613.58$$

6) You invest $30,000 in an account with 2% interest, compounded daily. Assume you don't touch the money or add money other than the earned interest. (4 pts)

a) Write an equation that gives the amount of money, y, in the account after x years.

$$y = 30,000 \left(1 + \frac{.02}{365}\right)^{365x}$$

b) How much money will you have in the account after 6 years?

$$y = 30,000 \left(1 + \frac{.02}{365}\right)^{(365 \cdot 6)}$$

$$= 33,824.79$$

7) Which would be a better deal? You invest $1,000,000 in an account with 2% interest that compounds interest annually or you invest in an account with 1.99% the same interest compounded daily? Explain your answer and show work to support your answer. (4 pts)

$$y = 1,000,000 \left(1 + \frac{.02}{1}\right)^{1}$$

$$= \$1,020,000$$

compared to

$$y = 1,000,000 \left(1 + \frac{.0199}{365}\right)^{365 \cdot 1}$$

$$= 1,020,098.77$$

better deal

Extra credit:

(+2 pts)

After an oven is turned on, its temperature, T, is represented by the equation $T = 400 - 350(3.2)^{-0.1m}$, where m represents the number of minutes after the oven is turned on and T represents the temperature of the oven, in degrees Fahrenheit.

a) What is the temperature of the oven after 5 minutes? (Round to the nearest degree.)

$$T = 400 - 350(3.2)^{(-.1 \times 5)} = 204°$$

b) About how many minutes does it take for the oven's temperature to reach 300°F? Show your work and/or explain how you arrived at an answer.

$$300° = 400 - 350(3.2)^{-.1(11)}$$

about 11 minutes