Exponential Growth and Decay Problems 4 **Name**

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

a) $y = 5(2)^x$ Growth 100%

b) $y = 100(.5)^x$ decay 50%

c) $y = 80(1.3)^x$ Growth 30%

d) $y = 20(0.8)^x$ Decay 20%

e) $y = 20(1.025)^x$ Growth 2.5%

f) $y = 40(.60)^x$ Decay 40%

2) Since January 1980, the population of the city of Brownville has grown according to the mathematical model $y = 720{,}500(1.022)^x$, where x is the number of years since January 1980.

a) Explain what the numbers 720,500 and 1.022 represent in this model.

720,500 Initial population in 1980

1.022 ↑ rate of Growth 2.2%

b) What would the population be in 2000 if the growth continues at the same rate.

≈ 1,113,401 people

c) Use this model to predict about when the population of Brownville will first reach 1,000,000.

≈ 1996

3) A population of 800 beetles is growing each month at a rate of 5%.

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

$y = 800(1.05)^x$ or $800(1+.05)^x$

b) About how many beetles will there be in 8 months?

1181 beetles

4) The half-life of a medication is the amount of time for half of the drug to be eliminated from the body. The half-life of *Advil* or ibuprofen is represented by the equation $R = M(0.5)^{\frac{t}{2}}$, where R is the amount of Advil remaining in the body, M is the initial dosage, and t is time in hours.

a) A 200 milligram dosage of Advil is taken at 1:00 pm. How many milligrams of the medication will remain in the body at 6:00 pm?

35.36 milligrams

b) If a 200 milligram dosage of Advil is taken how many milligrams of the medication will remain in the body 12 hours later?

3.125 milligrams

5) Your new computer cost $1500 but it depreciates in value by about 18% each year.

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

$y = 1500(1-.18)^x$ or $y = 1500(.82)^x$

b) How much will your computer be worth in 6 years?

$456.01

c) About how long will it take before your computer is worth close to zero dollars, according to your equation?

worth less than $.50 after 40 years

answers may vary

6) ~~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.

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

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

c) How much money will you have in the account after 25 years?

Determine whether the function represents a growth or decay and find the percent of growth/decay.

1) $y = 7(.98)^x$ Initial amount 7 Growth or (Decay) % of Growth or Decay 2%	2) $y = 75(1.45)^x$ Initial amount 75 (Growth) or Decay % of Growth or Decay 45%	3) $y = 4(\frac{2}{7})^x$ Initial amount 4 Growth or (Decay) % of Growth or Decay 71%
4) $y = .4(3)^x$ Initial amount .4 (Growth) or Decay % of Growth or Decay 200%	5) $y = 2(\frac{5}{2})^x$ Initial amount 2 (Growth) or Decay % of Growth or Decay 150%	6) $y = (.5)^x$ Initial amount 1 Growth or (Decay) % of Growth or Decay 50%

Using a calculator, write the Exponential Function for each table below.

7) $y = 12(2.9)^x$

x	y
0	12
1	34.8
2	100.92
3	292.668
4	848.7372

Initial Amount 12

Rate of (Growth)/ Decay

190%

8) $y = 4(.5)^x$

x	y
1	2
2	1
3	.5
4	.25
5	.125

Initial Amount 4

Rate of Growth/ (Decay)

50%

9) $y = 9.4(.3)^x$

x	y
2	.846
3	.2538
4	.07614
5	.022842
6	.0068526

Initial Amount 9.4

Rate of Growth/ (Decay)

70%

10)

Years since 2000	4	8	12	16
Population	336	5376	86016	1376256

Write an exponential function that represents the population since 2000. $y = 21(2)^x$

What is the rate of growth? 100%

What will the population be in 2010? 21,504

In what year will the population reach 2,500,000? between 2016 -2017

Determine whether each function represents a growth or decay. Find the equation of the asymptote, domain and range for each.