Name: ______________________________ **Date:** ________________

Lesson 6 Practice Problems

Section 6.1: Writing Exponential Models

1. Complete the following table.

Growth Rate as a %	Growth Rate as a decimal	Growth Factor
13%	0.13	1.13
21%		
7%		
	0.20	
	0.05	
		1.25
		1.075
		2.03

2. Complete the following table.

Decay Rate as a %	Decay Rate as a decimal	Decay Factor
12%	0.12	0.88
23%		
3%		
	0.18	
	0.02	
		0.75
		0.98
		0.05

3. Write the exponential function for each of the following.

	Initial Value	Rate	Function
a)	1500	Growth Rate = 15%	
b)	75	Decay Rate = 15%	
c)	1250	Growth Rate = 7.5%	
d)	12	Growth Rate = 112%	
e)	1000	Decay Rate = 12%	
f)	56	Decay Rate = 5%	
g)	100	Decay Rate = 0.5%	
h)	57	Decay Rate = 6.2%	

4. For each exponential function, identify the Initial Value and the Growth/Decay Rate.

a) $f(x) = 1000(0.98)^x$

Initial Value =____________

Decay Rate = ____________

b) $g(x) = 3200(1.32)^x$

Initial Value =____________

Growth Rate = ____________

c) $p(t) = 50(0.75)^t$

Initial Value =____________

Decay Rate = ____________

d) $f(x) = 120(1.23)^x$

Initial Value =____________

Growth Rate = ____________

e) $A(r) = 1000(4.25)^r$

Initial Value =____________

Growth Rate = ____________

f) $g(x) = 1200(0.35)^x$

Initial Value =____________

Decay Rate = ____________

5. Complete the table below.

	Exponential Function	Growth or Decay?	Initial Value a	Growth/Decay Factor b	Growth/Decay Rate, r (as a decimal)	Growth/Decay Rate, r (as a %)
a)	$f(t) = 45(0.92)^t$					
b)	$y = 423(1.3)^t$					
c)		Growth	25			5.9%
d)		Decay	33.2			12.3%
e)			225	0.83		
f)			832	1.12		

6. When a new charter school opened in 2005, there were 300 students enrolled. **Using function notation**, write a formula representing the number, N, of students attending this charter school *t* years after 2005, assuming that the student population

   a) Decreases by 20 students per year.

   b) Decreases by 2% per year.

   c) Increases by 30 students per year.

   d) Increases by 6% per year.

   e) Decreases by 32 students per year.

   f) Increases by 30% per year.

   g) Remains constant (does not change).

   h) Increases by 100% each year.

Section 6.2: Doubling Time and Halving Time

7. Determine the doubling or halving amount and the corresponding doubling or halving equation for the following functions.

	Function	Doubling or Halving Amount	Doubling or Halving Equation
a)	$f(t) = 200(1.2)^t$		
b)	$f(x) = 200(0.8)^x$		
c)	$y = 1500(1.5)^t$		
d)	$p(t) = 3000(1.45)^t$		
e)	$g(x) = 3000(0.99)^x$		
f)	$S(t) = 25000(0.08)^t$		
g)	$h(t) = 5.2(0.57)^t$		
h)	$A(t) = 93.4(1.42)^t$		

8. Find the Doubling Time or Half Life for each of the following. Use the intersect feature on your graphing calculator. (You may use your doubling or halving equation from problem 7. Round your answer to two decimal places.)

a) $f(t) = 200(1.2)^t$

DOUBLING EQUATION: ___________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

DOUBLING TIME (Rounded to two decimal places): _________________________

b) $f(x) = 200(0.8)^x$

HALVING EQUATION: ___________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

HALVING TIME (Rounded to two decimal places): _________________________

c) $y = 1500(1.5)^t$

DOUBLING EQUATION: ____________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

DOUBLING TIME (Rounded to two decimal places): __________________________

d) $p(t) = 3000(1.45)^t$

DOUBLING EQUATION: ____________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

DOUBLING TIME (Rounded to two decimal places): _______________________

e) $g(x) = 3000(0.99)^x$

HALVING EQUATION: ______________________________

CORRESPONDING GRAPH:

Xmin = ________ Xmax = ________

Ymin = ________ Ymax = ________

HALVING TIME (Rounded to two decimal places): ________________________

f) $S(t) = 25000(0.80)^t$

HALVING EQUATION: ______________________________

CORRESPONDING GRAPH:

Xmin = ________ Xmax = ________

Ymin = ________ Ymax = ________

HALVING TIME (Rounded to two decimal places): ____________________________

g) $h(t) = 5.2(0.50)^t$

HALVING EQUATION: ___________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

HALVING TIME (Rounded to two decimal places): _________________________

h) $A(t) = 93.4(1.42)^t$

DOUBLING EQUATION: ___________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

DOUBLING TIME (Rounded to two decimal places): _________________________

i) $A(t) = 5.24(2)^t$

DOUBLING EQUATION: ____________________________

CORRESPONDING GRAPH:

Xmin = _______ Xmax = _______

Ymin = _______ Ymax = _______

DOUBLING TIME (Rounded to two decimal places): __________________________

9. Amytown USA has a population of 323,000 in 1996. The growth rate is 8.4% per year. Show complete work for all problems.

   a) Find the exponential function for this scenario, $(t) = a \cdot b^t$, where t is the number of years since 1996 and *P(t)* is the population *t* years after 1996.

   b) Determine the population of Amytown in 2013.

   c) Determine the year in which the population of Amytown will double.

10) Since 2003, the number of fish in Lake Beckett has been decreasing at a rate of 2.3% per year. In 2003, the population of fish was estimated to be 63.2 million. Show complete work for all problems.

    a) Find the exponential function for this scenario, $(t) = a \cdot b^t$, where *t* is the number of years since 2003 and *F(t)* is the number of fish in millions *t years* after 2003.

    b) Determine the number of fish in Lake Beckett in 2020.

    c) Determine in what year the population of fish will be half the amount it was in 2003.

Section 6.3: Exponential Regression

11. Determine the exponential regression equation that models the data below:

t	0	1	2	4	6	9	12	16
$P(t)$	97	87	78	62	51	36	25	17

When you write your final equation, round "a" to one decimal place and "b" to three decimal places.

a) Write exponential regression equation in the form $y = ab^x$: ______________________

Rewrite exponential regression equation in the form $P(t) = ab^t$: ____________________

b) Use your graphing calculator to generate a scatterplot of the data *and* the graph of the regression equation on the same screen. You must use an appropriate viewing window. In the space below, draw what you see on your calculator screen, and write down the viewing window you used.

Xmin=____________

Xmax=____________

Ymin=____________

Ymax=___________

c) What is the rate of decay (as a %) for this function? _________________________

d) Using your regression model, determine $P(8)$.

e) Using your regression model, find t so that $P(t) = 40$. Show complete work.

12. The table below shows the value, V, of an investment (in thousands of dollars) after *n* years.

n	0	3	5	10	15	22
V(*n*)	3.74	4.58	5.24	7.46	10.21	17.01

a) Use your calculator to determine the exponential regression equation that models the set of data above. Round the "*a*" value to two decimals, and round the "*b*" value to three decimals. Use the indicated variables and proper function notation.

b) Based on the your regression model, what is the percent increase per year?

c) Find *V(8),* and interpret its meaning in a complete sentence. Round your answer to two decimal places.

d) How long will it take for the value of this investment to reach $50,000? Round your answer to two decimal places. Write your answer in a complete sentence.

e) How long will it take for the value of the investment to double? Round your answer to two decimal places. Write your answer in a complete sentence.

f) How long will it take for the value of the investment to triple? Round your answer to two decimal places. Write your answer in a complete sentence.

13. The following data represents the number of radioactive nuclei in a sample after t days.

t = time in days	0	1	4	6	9	12	17
N(t) = number of nuclei	2500	2287	1752	1451	1107	854	560

Round any answers to 3 decimal places.

a) Use the exponential regression feature of your calculator to find the model of the form $N(t) = a \cdot b^t$.

b) Using your model, find the number of nuclei after 5 days.

c) Using your model, find when there will be 1000 nuclei.

d) Use your model to find the number of nuclei after 9 days. How does this compare to the data value in the table?

e) Do the data values and regression values always match up? Why or why not?