

MATH 1101/24  
Practice Test #3  
Fall 2009

**Instructions:** In most of the following questions, if you simply answer with a number or an algebraic expression, that will be insufficient and points will be deducted. As has been told to you in class: A number without any words to describe its meaning is, for the most part, meaningless and worthless! Better yet, you should put the words into complete sentences that appropriately communicate the full meaning of an answer. Write neatly in an organized manner. You must show the calculations that support your answers, even if you do use your calculator; sometimes, drawing and labeling a picture, graph, or diagram can be helpful.

1. (9) You deposit \$75 in a savings account. Here is a table of values of the balance  $B = B(t)$  (in dollars), with time  $t$  measured in years.

$t$	0	1	2	3
$B$	75.00	81.00	87.48	94.48

- (a) What is the yearly growth factor for  $B$ ? (Round your answer to 2 decimal places.)
- (b) Write down the fully-documented exponential function that gives the balance  $B$  as a function of time  $t$ .
- (c) What monthly interest rate best represents the growth of this account?

2. (6) In the early 1990s Microsoft had revenues  $R$  that were nearly exponential as a function of time. In the following table,  $R$  is revenue in billions of dollars, and  $t$  is years since 1989.

$t$	0	1	2	3	4
$R$	0.8	1.1	1.8	2.7	3.75

- (a) Use exponential regression to find an exponential model for this data. (Be sure to fully document the exponential model that you write down.)
- (b) If this trend had persisted, what would have been Microsoft's revenues for 2001?

3. (3) Suppose the function  $f$  is an exponential function with  $f(4) = 8$  and  $f(5) = 10$ . What is the growth factor for  $f$ ?

4. (6) You initially invest \$500 in a savings account that pays a yearly interest rate of 4%. Write a formula for the exponential function giving the balance in your account as a function of the time since your initial investment. Then determine how long it will take for the account's balance to reach \$740.

5. (6) For the investment described in question #4 above, determine both the monthly interest rate and the quarterly interest rate (express both answers to 3 decimal places).

6. (6) The following table shows the size, in thousands, of an animal population at the start of the given year. Find an exponential model for this population.

Year	Population (thousands)
2001	2.30
2002	2.51
2003	2.73
2004	2.98
2005	3.25

7. (6) The following table shows the income, measured in thousands of dollars, from sales of a certain magazine at the start of the given year. Find an exponential model for the income.

Year	2001	2002	2003	2004	2005
Income	8.10	8.59	9.10	9.65	10.23

8. (12) One of the two tables below shows data that are better approximated with a linear function, and the other shows data that are better approximated by an exponential function. Determine the appropriate regression to use for each table's data, and write down the regression model for each one.

$t$	$f(t)$
1	3.62
2	23.01
3	44.26
4	62.17
5	83.25

**Table A**

$t$	$g(t)$
1	3.62
2	5.63
3	8.83
4	13.62
5	21.22

**Table B**

9. (12) A pan of cake batter is initially at a room temperature of 75 degrees. The pan is placed in a 350-degree oven to bake. Let  $C = C(t)$  denote the temperature of the cake batter  $t$  minutes after it is placed in the oven. The temperature of the cake batter is given by the formula  $C = \text{Limiting value} - D$ , where  $D$  represents the difference between the oven temperature and the temperature of the batter.

(a) What is the limiting value of  $C$ ?

(b) It's been found that  $D$  is an exponential function. What is the initial value of  $D$ ?

(c) After 10 minutes, the temperature of the cake batter is 165-degrees. What is the formula for  $D$ ?

(d) Find a model for the temperature of the cake batter  $t$  minutes after it is placed in the oven.

10. (6) A certain phenomenon has an initial value of 11 and grows at a rate of 9% per year. Give a properly annotated exponential function that describes this phenomenon. (Use  $t$  in years as your variable.)

11. (6) Make an exponential model for this data:

$x$	0	4	8	12
$y$	1200.0	252.0	52.9	11.1

12. (12) You are saving money with the hope of buying a new car after several years. Both the balance in your savings account and the cost of the car grow exponentially over time. Let  $t$  be time in years since the start of 1998.

(a) The cost  $C$  (in dollars) of the car at the start of 1998 is \$14,000, and the yearly growth factor for the cost is 1.02. Find a formula for  $C$  as a function of  $t$ .

(b) At the start of 1998 you invest \$12,000 in a savings account. The yearly percentage growth rate for the account balance  $B$  (in dollars) is 4.3%.

i. Find the yearly growth factor for  $B$ .

ii. Find a formula for  $B$  as a function of  $t$ .

iii. Use your answer to Part (a) and to Part (ii) above to determine at what time your account balance will be large enough so that you are able to afford the new car.

13. (10) The following table gives the Dow Jones Industrial Average  $D$  as a function of time  $t$ , measured in years since 1987. (Assume that a whole number value for  $t$  indicates the beginning of that year.)

$t$	0	4.75	7.9	8.6	9.85
$D$	2000	3000	4000	5000	6000

(a) Use exponential regression to find an exponential model for  $D$ .

(b) What is the annual percentage growth rate of  $D$ ?

(c) Based on the exponential model of  $D$ , when do you predict that the Dow-Jones will reach 10,000?