University of Waterloo Term Test 2

Math 109 Mathematics for Accounting

Date: November 23, 2011

Time: 4:30 p.m. - 6:20 p.m. Test type: Closed Book

Number of pages: 10 (including cover page)

Additional material allowed:

Non-programmable, non-graphing non-integrating calcluator.

Circle your section number

Instructor	Section	Lecture Time	
Fiona Dunbar	001	(12:30 p.m 1:20 p.m.)	
Paula Smith	002	(1:30 p.m 2:20 p.m.)	

Instructions

- 1. Write your name and ID number at the top of this page. Please circle your section number up above.
- 2. Answer the questions in the spaces provided, using the backs of pages for overflow or rough work.
- 3. Show all the work required to obtain your answers for full credit.
- 4. The maximum possible grade is 100 points.

FOR INSTRUCTOR'S USE ONLY				
Question	Mark	Question	Mark	
1	/10	7	/5	
2	/7	8	/12	
3	/18	9	/6	
4	/4	10	/7	
5	/8	11	/6	
6	/7	12	/10	
		Total	/100	

1. (a) Find the vertex of the parabola f(x) = x(x+3) - 12. State whether f has a maximum value or a minimum value.

(b) The demand function for a product is p = 200 - 2q, where p is the price in dollars per unit when q units are demanded. Find the level of production that maximizes total revenue, and determine this revenue.

2. Suppose a manufacturer produces a product whose total fixed cost is \$15 and variable cost per unit is \$1. The total revenue for selling q units is $y_{TR} = q^2 + 13$. Determine the output and revenue at the break-even point and state the interval of production that result in a profit.

- 3. Solve each of the following equations for x.
 - (a) $\log_2 x + \log_4 x = 1$

(b) $e^{2x-5} + 1 = 4$

(c) $5(2\log x + \log x^2 - \log x) = 15.$

4. The demand equation for a consumer product is $q = 80 - 2^p$. Solve for p and express your answer in terms of natural logarithms.

5. A debt of \$3500 (due in 4 years) and \$5000 (due in 6 years) is to be repaid by a single payment of \$1500 now and three equal payments due each consecutive year from now. How much is each of the equal payments if the interest rate of 7% compounded annually is assumed?

6. A debt of \$750 (due in 10 years) and \$250 (due in 12 years) is to be repaid by a single payment now. How much is the payment if an interest rate of 8% compounded quarterly is assumed?

7. An investor has a choice of investing a sum of money at 5% compounded annually, or 4.5% compounded quarterly or 4.24% compounded continuously. Which is the best of the three rates?

- 8. In order to replace their computers in the future, a company is placing payments into a sinking fund at the end of each year so that after 5 years the amount in the fund is \$15,000.
 - (a) Assume the fund earns 6% compounded annually.
 - i. What is the amount of the equal payments?

ii. How much is in the fund at the end of three years?

(b) At the beginning of the fourth year, the interest rate decreases and the fund pays only 4% compounded annually. How much must the payments in the last two years be now in order to meet the target of \$15,000 at the end of year 5?

9. Determine the total interest for a 48-month auto loan of \$11,000 with monthly payments at the rate of 6% compounded monthly.

10. Let

$$A = \begin{pmatrix} 1 & 2\\ 0 & -1\\ 7 & 0 \end{pmatrix}$$
$$B = \begin{pmatrix} 1 & 3 & 0\\ 0 & 4 & -1 \end{pmatrix}$$

(a) Which is possible to do: A + B or $A + B^T$? Carry out the operation on the one that is possible.

(b) Which is possible to do: AB or AB^T ? Carry out the operation on the one that is possible.

11. Solve the system

 $\begin{array}{rcrcrcr} x_1 + 2x_2 &=& 4 \\ 7x_1 - 2x_2 &=& 8 \end{array}$

by finding the inverse of the coefficient matrix.

12. Solve the following system using matrix reduction. Express your solution in parametric form.

You may use the following Compound Interest Tables for selected values of n and r.

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This page is for rough work. It will not be graded.