CONCORDIA UNIVERSITY

Department of Mathematics and Statistics

Course	**Number**	**Section**
Math	208	EC
Examination	**Date**	**Pages**
Final	August 2008	3
Instructor		**EC Course Examiner**
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Instructions

- All scientific and programmable calculators are allowed
- Ten 8.5×11 single-sided pages of handwritten notes are allowed
- No other material is allowed

Formulas

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\,\frac{(1+i)^n - 1}{i}, \quad PV = PMT\,\frac{1-(1+i)^{-n}}{i}$$

Evaluation

All questions are worth 10 marks. The examination counts for 50% towards your final grade. Numerical answers should be in exact form whenever possible.

Questions

Question 1

The marketing research department for a company that manufactures and sells notebook computers established the following price-demand and revenue functions:

$$p(x) = 2,000 - 60x$$

$$R(x) = x(2,000 - 60x)$$

where $p(x)$ is the wholesale price in dollars at which x thousand computers can be sold, and $R(x)$ is in thousands of dollars. Both functions have domain $1 \leq x \leq 25$.

A Sketch a graph of the revenue function in a rectangular coordinate system.

B Find the output that will produce the maximum revenue. What is the maximum revenue to the nearest thousand dollars?

C What is the wholesale price per computer (to the nearest dollar) that produces the maximum revenue?

Question 2

Solve the following equations for x:

A $16^{329x+191} = 16^{204x-2059}$

B $(49)^{2x} = (7)^{x^2-12}$

C $\frac{3}{2}\log_b 4 - \frac{2}{3}\log_b 8 + \log_b 2 = \log_b x$

D $5\log_5(3x+8) - 5\log_5(2x-5) = 5$

E $\log_{10}(x+6) - \log_{10}(x-3) = 1$

Question 3

For $f(x) = 2x - 3$ and $g(x) = 3^{x-3}$ find the following:

A $\sum_{k=0}^{49} f(k) = f(0) + f(1) + f(2) + \cdots + f(49)$.

B $\sum_{h=0}^{19} g(h) = g(0) + g(1) + g(2) + \cdots + g(19)$.

Question 4

In four years, you have decided to take a two day ``Earth Orbital Tour", offered by NASA Enterprises Inc. This little adventure will cost you $\$100,000$. Your local loan shark offers you 7.2% interest compounded bi-monthly(twice each month).

A The total amount of $\$100,000$ must be paid by departure date (four years). What are your bi-monthly payments?

B How much interest have you earned?

C If you could only afford bi-monthly payments of $\$800$, how long would it take you to acquire your Space vacation fund?

Question 5

While on a trip to Peru, you decided to buy an ``Inca Sacrificial Altar", for $\$160,000$. You decide on a down-payment of $\$40,000$ and to finance the remaining balance over 25 years with monthly payments. The local native bank offers you 5.4% interest compounded monthly.

A What are your monthly payments?

B You decide, after 15 years of unfair monthly payments, to payoff the remaining balance. What is the remaining balance?

C How much are you saving by paying off the remaining balance after 15 years?

Question 6

Solve by using Gauss-Jordan Elimination:

$$\begin{cases} 3x_1 + 6x_2 + 9x_3 = 3 \\ 2x_1 + 3x_2 + 4x_3 = 3 \\ 3x_1 + 6x_2 + 3x_3 = 9 \end{cases}$$

Remark *No other method of solving these systems of equations will be accepted. You may use elementary matrices to express the row operations involved.*

Question 7

An economy is based on three sectors, shipping, agriculture, and mining. Production of a dollar's worth of shipping requires an input of \$0.30 from the shipping sector, \$0.20 from the agriculture sector and \$0.40 from mining sector. Production of a dollar's worth of agriculture requires an input of \$0.30 from the shipping sector, \$0.20 from the agriculture sector and \$0.20 from mining sector. Production of a dollar's worth of mining requires an input of \$0.20 from the shipping sector, \$0.30 from the agriculture sector and \$0.30 from mining sector.

A Write the technological matrix M for this economy.

B If a final demand of \$180 million for shipping, \$200 million for agriculture, and \$300 million for mining is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.

C Solve the respective inputs satisfying these demands.

Question 8

Find the extrema of the function $P(x, y) = 180x - 1202y$ subject to

$$x + y \leq 30,\ 3x + 5y \geq 15,\ 5x + 3y \geq 15,\ x \geq 0,\ y \geq 0\,.$$

Question 9

The 2003 Toyota Matrix was first made available with 2 different engines and with 3 levels of trim, plus either front-wheel or all-wheel drive.

A How many different Toyota Matrix cars (not counting color) were available for purchase?

B If you include color and there were 6 colors available, how many different Toyota Matrix cars were available for purchase?

Question 10

A shipment of 40 Mickey Mouse watches contains 6 defective ones. The shipping department selects seven of these watches and rejects the entire shipment if one or more are defective.

A What is the probability that the entire shipment shall be accepted?

B What is the probability that the entire shipment shall be rejected?