AN eCONCORDIA EXAMINATION
CONCORDIA UNIVERSITY

Department of Mathematics and Statistics

Course	**Number**	**Section**
Math	208	EC
Examination	**Date**	**Pages**
Alternate Final	August 2011	3
Instructor		**EC Course Examiner**
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Instructions

- Answer all ten questions.
- Only approved calculators 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 of equal value. The examination counts for 50% towards your final grade. Numerical answers should be in exact form whenever possible.

Questions

Question 1

A plant can manufacture 50 tennis rackets per day for a total daily cost of $\$3,855.00$ and 60 rackets per day for a total daily cost of $\$4,245.00$.

a. Assuming that the daily cost and production are linearly related, find the total daily cost $C(x)$ of producing x rackets.

b. Graph the total daily cost for $0 \leq x \leq 100$.

c. Interpret the slope and y-intercept of this cost function.

Question 2

Solve the following equations for x :

a. $7^{x^2} = 7^{2x+3}$

b. $4^{5x-x^2} = 2^{-12}$

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

d. $\log_b (x+2) + \log_b x = \log_b 24$

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

Question 3

a. Find $f(1) + \cdots + f(225)$ if $f(x) = 3x - 7$.

b. Find $g(1) + \cdots + g(121)$ if $g(x) = \left(\frac{1}{3}\right)^x$.

Question 4

A company establishes a sinking fund to buy new computer equipment with monthly payments of $\$2,000$, paying 5% compounded monthly.

a. How long will it be before the account is worth $\$75,000$? (Round up to the next higher month if not exact.)

b. How much interest will be earned?

Question 5

A family has a $\$280,000$, 25-year mortgage at 3.4% compounded monthly.

a. Find the monthly payments.

b. Find the unpaid balance after 15 years.

c. Find the unpaid balance after 20 years.

Question 6

Solve the following system of linear equations by Gauss-Jordan elimination (no other method of solving this system will be accepted).

$$\begin{cases} x + 2y + 3z = 5 \\ 3x - y - 2z = 10 \\ 2x + 4y - z = 9 \end{cases}$$

Question 7

An economy is based on three sectors: agriculture, manufacturing and energy.

- Production of a dollar's worth of agriculture requires inputs of $\$0.20$ from agriculture, $\$0.20$ from manufacturing and $\$0.20$ from energy.
- Production of a dollar's worth of manufacturing requires inputs of $\$0.40$ from agriculture, $\$0.10$ from manufacturing and $\$0.10$ from energy.
- Production of a dollar's worth of energy requires inputs of $\$0.30$ from agriculture, $\$0.10$ from manufacturing and $\$0.10$ from energy.

Find the output from each sector that is needed to satisfy a final demand of $\$10$ billion from agriculture, $\$15$ billion from manufacturing, and $\$20$ billion from energy.

Question 8

Minimize or maximize, as appropriate, the function $P = 2x + y$, subject to

$$\begin{cases} x + y \geq 2 \\ 6x + 4y \leq 36 \\ 4x + 2y \leq 20 \\ x, y \geq 0 \end{cases}$$

Question 9

A chain of jewelry stores with 8 stores in Quebec, 12 in Ontario, and 10 in Manitoba is planning to close 10 of its stores.

a. In how many ways can this be done?

b. The company decides to close 2 stores in Quebec, 5 in Ontario, and 3 in Manitoba. In how many ways can this be done?

Question 10

A shipment of 100 watches, including 6 that are defective, is sent to a store. The receiving department selects 10 at random for testing and rejects the whole shipment if one or more watches in the sample are found to be defective. What is the probability that the shipment is rejected?