Concordia University

Department of Mathematics and Statistics

Course	Number		Section
Mathematics	208/4		eConcordia
Examination	**Date**	**Time**	**Pages**
Final	April 2013	3 Hours	3
Instructor			**Course Examiner**
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Formulas

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

Special Instructions

- Answer all questions. All questions are of equal value.
- Only approved calculators are allowed.
- This examination counts for 50% of your final mark.

Question 1

Joanne Ha sells silk-screened T-shirts at community festivals and crafts fairs. Her marginal cost to produce one T-shirt is $3.50. Her total cost to produce 60 T-shirts is $300, and she sells them for $9 each.

1. Find the linear cost function for Joanne' s T-shirt production.
2. How many T-shirts must she produce and sell in order to break even?

Question 2

Solve the following equations for *x*:

(A) $\left(\frac{5}{6}\right)^x = \frac{36}{25}$ (1)

(B) $(4)^{x+1} = (8)^{2-x}$ (2)

(C) $\mathrm{Log}_5[x+6] + \mathrm{Log}_5[x+2] = 1$ (3)

(D) $\text{Log}_2[2x] = 4 - \text{Log}_2[x+2]$ (4)

(E) $\text{Log}_3\left[\frac{5x}{x-2}\right] = 2$ (5)

Question 3

For *f(x) = -28x +6* and *g(x)* = $5(1.8)^x$, find the following:

(A) $\sum_{k=0}^{41} f[k] = f[0] + f[1] + f[2] + \cdots + f[41]$ (6)

(B) $\sum_{h=0}^{30} g[h] = g[0] + g[1] + g[2] + \cdots + g[30]$ (7)

Question 4

Joe Seniw bought a rare stamp for his collection. He agreed to pay a lump sum of $4,000 after 5 years. Until then, he pays 6% simple interest semi-annually.

1. Find the amount of each semi-annual interest payment.
2. Snew sets up a sinking fund so that enough money will be present to pay off the $4,000. He wants to make annual payments into the fund. The account pays 8% compounded annually. Find the amount of each payment.
3. Prepare a table showing the amount in the sinking fund after each deposit.

Question 5

The Beys plan to purchase a home for $212,000. They will pay 20% down and finance the reminder for 30 years at 7.2% interest, compounded monthly.

1. How large are their monthly payments?
2. What will be their approximate loan balance right after they have made their 96th payment?
3. How much interest will they pay during the 7th year of the loan?

Question 6

Consider the following linear system:

$\{x - y + 5z == -6,\ 3x + 3y - z == 10,\ x + 3y + 2z == 5\}$

1. Convert the system to an augmented matrix.

2. Calculate the reduced row echelon form of the matrix and us it to find the solution of the system.

No other method of solving the system counts for marks.

Question 7

An island economy consists of the sectors of tourism, agriculture and fishing. To produce a dollar's worth of tourism requires an input of \$0.20, \$0.20 and \$0.10 from tourism, agriculture and fishing respectively. A dollar's worth of agriculture requires inputs of \$0.20, \$0.10, and \$0.20 from tourism, agriculture, and fishing, respectively. On the other hand, a dollar's worth of fishing requires inputs of \$0.10 and \$0.10 from tourism and agriculture.

1. Write the technological matrix *M* for this island economy.
2. If a final demand of \$30 million, \$15 million and \$20 million from tourism, agriculture and fishing respectively is to be met, set up the equation that must be satisfied by the inputs from the three sectors.
3. Find the respective inputs satisfying these demands.

Question 8

Maximize or minimize, as appropriate, the function $P(x,y) = 10\,x + 25\,y$, subject to

$$x + 2\,y \le 20,\ 3\,x + 2\,y \ge 54,\ x \le 6,\ x \ge 0,\ y \ge 0.$$

Question 9

A package contains 100 fuses, of which 10 are defective. A Sample of 5 fuses is selected at random.

1. How many different samples are there?
2. How many of the samples contain 2 defective fuses?
3. How many of the samples contain at least 1 defective fuse?

Question 10

John is having a dinner party and is limited to 10 guests. He has 16 men friends and 12 women friends, including Laura and Mary.

1. If John chooses his guests at random, what is the probability that Mary and Laura are invited?
2. If John decides to invite 5 men and 5 women, what is the probability that Mary and Laura are invited?