CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	**Number**	**Section(s)**
Mathematics	208/2	All
Examination	**Date**	**Pages**
Final	December 2007	3

FORMULAE:

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

Special Instructions:

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

MARKS

[10] **1.** Given $y = -4x^2 + 12x - 12$,

(A) Find the x- and y- intercepts and the vertex.

(B) Use this information to graph $y = -4x^2 + 12x - 12$.

(C) Does the line $y = x - 1$ intersect $y = -4x^2 + 12x - 12$? Justify your answer!

[10] **2.** Solve for x in the following equations:

(A) $e^{287x-721} = e^{152x-2071}$

(B) $(0.5)^{-3x^2+15x-72} = (0.5)^{-x^2+35x-22}$

(C) $\log_3\left(\frac{x}{5}\right) + \log_3 725 + 2\log_3\sqrt{5} = \frac{1}{3}\log_3\sqrt[3]{7} + 5\log_3 1$

(D) $\log_{11}(x+7) - \log_{11}(x+10) = \log_{11} 0.5$

(E) $\log_x 1000 = \frac{\ln 1000}{\ln 25}$

[10] **3.** For $f(x) = -12x + 16$ and $q(x) = 3(0.8)^x$ find the following:

(A) $\displaystyle\sum_{k=0}^{17} f(k) = f(0) + f(1) + f(2) + \cdots + f(17)\,.$

(B) $\displaystyle\sum_{h=0}^{14} g(h) = g(0) + g(1) + g(2) + \cdots + g(14)\,.$

(C) What is $\displaystyle\sum_{h=0}^{\infty} g(h) = g(0) + g(1) + g(2) + \cdots + g(n) + g(n+1) + \ldots$?

[10] **4.** You are planning to expand your hotel operation by buying a small island in the British Virgin Islands 3 years from now. For this you need a \$3,000,000 down payment. Your favourite bank offers you 7.2% interest compounded weekly for these 3 years.

(A) What are your weekly payments?

(B) How much interest are you earning?

(C) You decide that you only need a \$2,000,000 down payment, but add \$500 to each of the weekly payments obtained in (A). How soon will you have your \$2,000,000?

[10] **5.** The island in the British Virgin Islands costs \$25,000,000 for which you make a \$3,000,000 down payment, and you mortgage the remaining amount. Your favourite bank offers you 6.6% interest compounded bi-monthly (twice each month) for 12 years.

(A) What are your bi-monthly payments?

(B) How much interest is the bank making?

(C) What is your remaining balance after 10 years?

(D) If you decide to pay off the remaining balance after 10 years, how much are you saving?

(E) If you pay off the remaining balance after 8 years, how much are you saving over paying off the remaining balance after 10 years (as in (D))?

[10] **6.** You need to transport 170,000 gallons of caustic chemicals by means of 25 railway tank-cars with carrying capacities of 5,000, 10,000 and 15,000 gallons respectively.

(A) Write the linear system of equations in terms of x, y and z; x, y and z being the number of tank-cars with carrying capacities of 5,000, 10,000 and 15,000 gallons respectively.

(B) Solve this system of equations.

(C) If the rental of the 5,000, 10,000 and 15,000 gallon tank-cars costs \$400, \$700 and \$900 respectively, then which of the solutions yields the minimum cost?

[10] **7.** Find the inverse of the matrix

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

by means of Gauss-Jordan Row Reduction. **No other method of calculating A^{-1} will be accepted!**

[10] **8.** Extremize $P(x, y) = 20x - 15y$ subject to

$$x + 2y \geq 14,\ x + 3y \leq 42,\ 2x + y \leq 42,\ x \geq 0,\ y \geq 0\,.$$

[10] **9.** An island economy consists of the sectors of tourism, agriculture and fishing. To produce a dollar's worth of tourism requires an input of \$0.3, \$0.2 and \$0.1 from tourism, agriculture and fishing respectively. A dollar's worth of agriculture requires inputs of \$0.1 from each sector. On the other hand, a dollar's worth of fishing requires inputs of \$0.3, \$0.2 and \$0.1 from the sectors of tourism, agriculture and fishing.

(A) Write the technological matrix M for this island economy.

(B) If a final demand of \$20 million, \$5 million and \$10 million from tourism, agriculture and fishing 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.

[10] **10.** A clothing store chain has 5, 8 and 12 stores in New Brunswick, Nova Scotia and Quebec respectively.

(A) The chain decides to close 10 of its stores. In how many ways can this be accomplished?

(B) If the chain decides to close 2, 4, and 4 stores in New Brunswick, Nova Scotia and Quebec respectively, in how many ways can this be done?