UNIVERSITÉ Concordia UNIVERSITY

Examination Cover Sheet

COURSE:	NUMBER:	SECTION(S):	
MATH	208	All except EC	
EXAMINATION: ☒ FINAL ☐ ALTERNATE ☐ DEFERRED **VERSION:** _____	**DATE:** 12/9/17	**TIME:** 14:00 – 17:00 **Exam Length:** 3 hours	**PAGES:** including cover 4
INSTRUCTOR(S): ALL		**DIVISION:**	
MATERIALS ALLOWED: ☒ Booklets ☐ IBM (Scantron) ☐ Blue ☐ Green ☐ Printed Translation Dictionary Other_____ ☒ ENCS Approved calculator only ☐ Non Programmable calculator Other_____ ☐ Other _____		**INSTRUCTIONS:** ☒ Return all ☐ Answer on Exam ☐ Open book ☐ Crib sheet Details_____	

Please print your name, I.D. number and section in the appropriate spaces below.

STUDENT NAME: _____

I.D. NO. _____ **SECTION:** _____

SPECIAL INSTRUCTIONS:

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	208/2		All except EC
Examination	**Date**	**Time**	**Pages**
Final	December 2017	3 Hours	3
Instructors			**Course Examiner**
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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.** The marketing research department for a company that produces and sells a certain product established the following price-demand and cost functions:

$$p(x) = 25 - 2x, \qquad C(x) = 5x + 42,$$

where $p(x)$ is the wholesale price in dollars at which x thousand units of product can be sold and $C(x)$ is in thousands of dollars. Both functions have the domain $0 \le x \le 12$.

(A) Form the revenue function $R(x)$ and find the break-even points.

(B) Form the profit function $P(x)$ and find the maximum profit.

(C) What price will maximize the profit?

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

(A) $2^{x^2} - (4)^3 2^x = 0$

(B) $(9^{2x})9^{-6} = (3^{x^2})27^{-x}$

(C) $\ln(x+1) = 10\ln\sqrt{2} - \ln(x-3)$

(D) $\log_2(x+2) + \log_2(x-3) = \log_2(2x-5) + 1$

(E) $\log_2(2x^2)^{1/3} + \frac{1}{3} = 2$

[10] **3.** (A) Evaluate the sum

$$\sum_{k=0}^{2017} (5k+3).$$

(B) Is it possible that $S_\infty = 2017$ is the sum and $a_1 = -2018$ is the first term of an infinite geometric series? If your answer is "yes," find the common ratio. If your answer is "no," explain why.

[10] **4.** A couple wishes to borrow money using the equity in their home for collateral. A loan company will loan them up to 70% of their equity. They purchased their home 7 years ago for \$85,900. The home was financed by paying 5% down and signing a 20-year mortgage at 7.5% on the unpaid balance. Equal monthly payments were made to amortize the loan over the 20-year period. The net market value of the house is now \$105,000. After making their 84th payment, they applied to the loan company for the maximum loan. How much (to the nearest dollar) will they receive?

[10] **5.** An ordinary annuity pays 6.48% compounded monthly.

(A) Earl wants to make equal monthly deposits into the account for 15 years in order to then make equal monthly withdrawals of \$1,000 for the next 20 years, reducing the balance to zero. How much should be deposited each month for the first 15 years? What is the total interest earned during this 35 year process?

(B) If Larry makes equal monthly deposits of \$1,000 for the first 15 years, how much can be withdrawn monthly for the next 20 years? What is the total interest earned during this 35 year process?

[10] **6.** Given that

$$\mathrm{M} = \mathrm{I} + 2\begin{bmatrix} 1 & 2 & 0 \\ 1 & 0 & -2 \\ 0 & -2 & 2 \end{bmatrix} - \begin{bmatrix} 0 & -1 & 1 \\ 0 & 0 & -1 \\ 1 & 0 & 0 \end{bmatrix},$$

where I is the identity matrix,

(A) Find M.

(B) Find the inverse M^{-1}.

[10] **7.** The officers of a high school senior class are planning to rent buses and vans for a class trip. Each bus can transport 60 students, requires 3 chaperones, and costs \$1,200 to rent. Each van can transport 12 students, requires 1 chaperone, and costs \$150 to rent. Since there are 900 students in the senior class that may be eligible to go on the trip, the officers must plan to accommodate at least 900 students. Since only 51 parents have volunteered to serve as chaperones, the officers must plan to use at most 51 chaperones.

(A) How many vehicles of each type should the officers rent in order to minimize the transportation costs?

(B) What are the minimal transportation costs?

[10] **8.** Extremize $P(x, y) = 3x + 4y$ subject to

$$2x + y \leq 14,\ x + y \leq 9,\ x + 2y \leq 16,\ x + y \geq 4,\ x \geq 0,\ y \geq 0.$$

[10] **9.** A manufacturer has 20 distinct candies to place into a rectangular box that has 4 rows and 5 columns. Five of the candies are blue.

(A) How many arrangements are possible if all blue candies must be in the first row?

(B) Find the number of arrangements having no blue candies in the first column.

(C) Find the number of arrangements having only blue candies in the first column.

[10] **10.** An urn contains 3 one-dollar bills, 1 five-dollar bill and 1 ten-dollar bill. A player draws bills one at a time without replacement from the urn until a ten-dollar bill is drawn. Then the game stops. All bills are kept by the player. Determine:

(A) The probability of winning \$11.

(B) The probability of winning all bills in the urn.

(C) The probability of the game stopping at the third draw.