CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	209	All except EC
Examination	**Date**	**Pages**
Final	April 2011	3

Instructors — **Course Examiner**

F. Balogh, C. Cummins, H. Kisilevsky, A, Kokotov, D. Koukoulopoulos, R. Mearns, B. Rhodes, F. Romanelli, C. Santana, U. Tiwari. — R. Raphael

Special Instructions

- ▷ Ruled booklets to be used.
- ▷ **Only approved calculators are allowed.**

MARKS

[9] **1.** (a) Let $f(x) = \frac{2x^2-3x-2}{x^2+x-6}$. Find

(A) $\lim_{x\to 2} f(x)$ (B) $\lim_{x\to 0} f(x)$

(b) Given that $\lim_{x\to 1} g(x) = -5$ and $\lim_{x\to 1} h(x) = 4$, find the

$\lim_{x\to 1} \sqrt{h(x) - g(x)}$

(c) If $\lim_{x\to 3} k(x) = 4$, then $\lim_{x\to 4} k(x) = 5$. True or False. Explain your answer.

[10] **2.** (a) If $g(x) = 3x^2 - 7x^3 + x\sqrt{x}$, find $g'(x)$.

(b) If $f(x) = \frac{x+3}{x^2-4}$, find $f'(x)$.

(c) If $y = 3e^2$, find y'.

(d) If $y = \sqrt[5]{x^5 - 1}$, then $y' = ?$

(e) Find y' if $y^2 + x = e^y$.

[9] **3.** Given the price-demand equation

$$0.02x + p = 60$$

(A) Express the demand x as a function of the price p.

(B) Express the revenue R as a function of the price p.

(C) Find the elasticity of demand, $E(p)$.

[9] **4.** Let $y = f(x) = x^2 + 2x + 3$. Suppose $x = -2$, $\triangle x = dx = -0.1$. Find $\triangle y$ and dy.

(b) Display $\triangle y$ and dy on a graph of $f(x)$.

[9] **5.** The total profit (in dollars) from the sale of x gas grills is

$$P(x) = 20x - 0.02x^2 - 320 \qquad 0 \leq x \leq 1,000$$

(A) Find the average profit per grill if 40 grills are produced.

(B) Find the marginal average profit at a production level of 40 grills and interpret the result.

[9] **6.** A point is moving on the graph of $y^3 = x^2$. When the point is at $(-8,\ 4)$, its y co-ordinate is decreasing by 2 units per second. How fast is the x co-ordinate changing at that moment?

[6] **7.** Evaluate the following integrals [accurate to 2 decimals].

(a) $\int_1^2 (2x + 3e^x - \frac{3}{x})\, dx$

(b) $\int_0^6 \frac{x}{x^2 + 5}\, dx$

[12] **8.** Compute the following:

(a) $\int e^{7x}\,dx$

(b) $\int (7x^4 - 3x^2)\,dx$

(c) $\int (x-7)^{-7}\,dx$

(d) $\int (x^2 - \pi\, x^3)\,dx$

(e) $\int \dfrac{3x^2}{5+2x^3}\,dx$

(f) $\int x(x^2-2)^{-4}\,dx$

[9] **9.** Find the area bounded by $f(x) = x^2 - x$ and $g(x) = 2x$ for $-2 \le x \le 3$.

[9] **10.** Use the graphing strategy to analyze the function

$h(x) = \frac{4x+3}{x^2}$

State all pertinent information and sketch the graph of h.

[4] **11.** Explain why the function

$$f(x) = \begin{cases} 1 & \text{if } x = 0 \\ \dfrac{|x|}{x} & \text{if } x \neq 0 \end{cases}$$

is not continuous at $x = 0$, but $[f(x)]^2$ is continuous at $x = 0$.

[5] **12.** Two new countries are created called A and B. The Lorenz curve for A is $x^{1.7}$ and the Lorenz curve for B is $x^{2.7}$. Which country has a higher Gini index, A or B? Why?