AN eCONCORDIA EXAMINATION

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	**Number**	**Section(s)**
Mathematics	209	EC
Examination	**Date**	**Pages**
Final	December 2012	3
Instructors		**Course Examiner**
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Special Instructions

▷ **Only approved calculators are allowed.**

Evaluation

▷ **The examination counts for 50% towards your final grade.**

MARKS

[9] **1.** (a) Let $f(x) = \dfrac{3 - x^2}{2x^3 - x^2 + 9}$. Find the limits:

(i) $\lim\limits_{x \to 1} f(x)$ (ii) $\lim\limits_{x \to \infty} f(x)$

(b) Given that $\lim\limits_{x \to -3} g(x) = 4$ and $\lim\limits_{x \to -3} h(x) = -5$, find the limit $\lim_{x \to -3} \sqrt{g(x) - h(x)}$.

(c) True or False: if $\lim\limits_{x \to 4} g(x) = 5$, then $\lim\limits_{x \to 3} g(x) = 4$. Explain your answer.

[13] **2.** (a) If $g(x) = -3x^4 + 2x^2 - \pi$, find $g'(x)$.

(b) If $f(x) = (\ln(x) + x)(2x^2 - 5)$, find $f'(x)$.

(c) If $y = \dfrac{(e^x - x)}{(x^2 - 2x)}$, find y'.

(d) If If $y = \sqrt[3]{x^5 - 7}$, then y' =?

(e) Find y' if $e^y = y^3 - 2x$.

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

$$.03x + 4p = 30$$

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

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

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

[11] **4.** A small machine shop manufactures drill bits used in the petroleum industry. The shop manager estimates that the total daily cost (in dollars) of producing x bits is

$$C(x) = 1,000 + 25x - 0.1x^2$$

(A) Find $\bar{C}(x)$ and $\bar{C}'(x)$.

(B) Find $\bar{C}(10)$ and $\bar{C}'(10)$, and interpret these quantities.

(C) Use the results in part (B) to estimate the average cost per bit at a production level of 11 bits per day.

[10] **5.** Find dy for $y = \sqrt{x} + 3$. Evaluate dy for

(A) $x = 4$ and $dx = 0.1$.

(B) $x = 9$ and $dx = 0.12$.

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

(a) $\displaystyle\int e^{-3x}\, dx$

(b) $\displaystyle\int (4x^3 - 7x^6)\, dx$

(c) $\displaystyle\int (x+9)^{-8}\, dx$

(d) $\displaystyle\int (ex^5 - x^2)\, dx$

(e) $\displaystyle\int \frac{x^2}{7 - x^3}\, dx$

(f) $\displaystyle\int x(x^2 - 5)^{-6}\, dx$

[6] **7.** Find the absolute maximum and absolute minimum value of $f(x) = x^3 - 12x$ on the interval $[-3, 3]$.

[6] **8.** Is there a function f from the reals to the reals which is not continuous, but has a continuous square? Justify your answer.

[11] **9.** Find all pertinent information about the function

$$h(x) = \frac{2x - 1}{x^2},$$

and sketch a graph of h.

[11] **10.** The Gini index for a Lorenz curve $f(x)$ is $2\int_0^1 (x - f(x))dx$. The Lorenz curve for a small country is $x^{2.3}$. Graph the curve and find the Gini index for this country.