CONCORDIA UNIVERSITY

Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	209	All except EC
Examination	**Date**	**Pages**
Final	April 2016	2

Instructors	Course Examiner
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Special Instructions

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

[MARKS]

[10] **1.** (a) Find $\lim_{x\to\infty} \frac{4x - x^3}{x^2 + 3}$.

(b) Give an example of a function f defined for all real numbers which has the property that $\lim_{x\to+1}$ and $\lim_{x\to-1}$ are both equal to $-\infty$.

[10] **2.** Find the derivatives for each of the following functions: (DO NOT SIMPLIFY):

(a) $g(x) = (e^2 - ln(x))\ (6\sqrt{x} - \frac{5}{x})$

(b) $h(x) = e^{(-x^3-7)} - x^2 ln(x)$

[7] **3.** Graph $x^2 + y^2 - 169 = 0$, find y' by implicit differentiation, and find the slope of the graph when x = 5.

[6] **4.** Find dh if $h = e^{1.5x}, x = 3$ and the change in the x is 0.2.

[11] **5.** A point is moving on the graph of $xy = 36$. When the point is at $(4, 9)$, its x coordinate is increasing by 4 units per second. How fast is the y coordinate changing at that moment?

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[11] **6.** Use the price-demand equation $0.02x + p = 60$ to find the values of p for which the demand is elastic and for which the demand is inelastic.

[11] **7.** For $f(x) = x^3 - 12x$ find the absolute maximum and minimum, if either exists, on the interval [-3,3].

[11] **8.** A lake used for recreational swimming is treated periodically to control harmful bacteria growth. Suppose that t days after a treatment, the concentration of bacteria per cubic centimeter is given by

$$C(t) = 30t^2 - 240t + 500 \qquad 0 \leqslant t \leqslant 8$$

How many days after a treatment will the concentration be minimal. What is the minimum concentration?

[11] **9.** Find the area bounded by $f(x) = 2x^2$ and $g(x) = 4 - 2x$ for $-2 \leq x \leq 2$.

[12] **10.** (a) It is not possible for country A to have a Gini index equal to twice the Gini index of country B. Explain why this is true or why it is false.

(b) A Gini index cannot equal a number a with the property that a is positive and $1 - a$ is also a Gini index. Explain why this is true or false.