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CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	209	All except EC
Examination	**Date**	**Pages**
Final	December 2010	3
Instructors		**Course Examiner**
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Special Instructions

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

MARKS

[12] **1.** (a) If $f(x) = 7x^5 + 8x^4 - x\sqrt{x}$, find $f'(x)$.

(b) If $f(x) = \frac{x^3-5x+2}{x^2-4}$ find $f'(x)$.

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

(d) If $y = 7e^{(2x^2+x)}$, then $y' = ?$

(e) If $y = \ln[\frac{1}{x^2+3}]$, then $\dfrac{dy}{dx} = ?$

(f) If $y = \sqrt[6]{x^6 - 7}$, then $\dfrac{dy}{dx} = ?$

(g) Find y' given $-x + y^3 = e^y - 7$.

[7] **2.** (i) Find $\lim\limits_{x\to-\infty} \dfrac{2x^2+3}{4x^3+7}$

(ii) Given $\lim\limits_{x\to-2} f(x) = 3$ and $\lim\limits_{x\to-2} g(x) = -6$, find

(a) $\lim\limits_{x\to-2} [f(x)g(x)]$ (b) $\lim\limits_{x\to-2} \sqrt{f(x)}$ (c) $\lim\limits_{x\to-2} 3\dfrac{-2g(x)}{f(x)}$

(iii) True or False:

if $\lim\limits_{x\to-2} f(x) = 5$, then $\lim\limits_{x\to0} f(x) = 3$.

Is this always true, Yes or No? Explain.

[10] **3.** The price-demand equation for a hamburgers at a fast food restaurant is

$$x + 400p = 3,000$$

Currently, the price of a hamburger is \$3.00. If the price is increased by 10% will revenues increase or decrease?

[7] **4.** Let $y = f(x) = 6x - x^2$

(a) Find $\triangle y$ and dy when $x = 2$

(b) Compare $\triangle y$ and dy from part (a) for $\triangle x = 0.2$

[5] **5.** Prove and discuss. Suppose $f(x)$ is continuous at $x = 5$. Then $g(x) = f(x) - 7$ is continuous at $x = 5$.

[11] **6.** Suppose that for a company manufacturing calculators, the cost, revenue and profit equations are given by

$$C = 90,000 + 30x \qquad R = 300x - \frac{x^2}{30} \qquad P = R - C$$

where the production output in 1 week is x calculators. If production is increasing at the rate of 500 calculators per week when production output is 6,000 calculators, find the rate of increase (decrease) in

(a) Cost (b) Revenue (c) Profit

[5] **7.** Suppose that a point is moving along the graph of $x^2 + y^2 = 25$. When the point is at (-3, -4), its x coordinate is increasing at the rate of 0.4 units per second. How fast is the y coordinate changing at that moment?

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

(a) $\int_0^5 (z^2 - 2)\, dz$

(b) $\int_2^4 e^{-x^2}\, xdx$

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

(a) $\int (3+x)^{-3}\ dx$

(b) $\int e^{5x}\,dx$

(c) $\int \dfrac{x-5}{\sqrt{x}}\,dx$

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

(e) $\int \dfrac{x^2}{4+x^3}\,dx$

(f) $\int (x^2-1)^{-3}x\,dx$

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

[13] **11.** Follow the graphing strategy and analyze the function $f(x) = \frac{2x}{(1-x)}$. State all the pertinent information and sketch the graph of f.

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Mathematics	209	All except EC
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Instructors

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Special Instructions

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

MARKS

[9] **1.** (i) Find $\lim_{x\to-\infty} \dfrac{-5x^7+3x^2+2}{4-x^2}$

(ii) Given $\lim_{x\to3} f(x) = -5$ and $\lim_{x\to3} g(x) = 4$, find

(a) $\lim_{x\to3} [-3g(x)]$ (b) $\lim_{x\to3} \sqrt{g(x)}$ (c) $\lim_{x\to3} [g(x)/2f(x)]$

(iii) Find the value of each of the following:

(a) $\lim_{x\to-3} \dfrac{x^2-3x+2}{(x-1)}$ (b) $\lim_{x\to5} \dfrac{x^2-16}{(x-5)}$

[18] **2.** (a) If $f(x) = 4-6x^{10}-4x^3$, find $f'(x)$.

(b) If $f(x) = \frac{x^2-3x+4}{x^2+1}$ find $f'(x)$.

(c) If $f(x) = \frac{x^2+5x}{e^x-7}$ find $f'(x)$.

(d) If $y = 2e^{(x^2-5)}$, then $y' = ?$

(e) If $y = \ln[(x^2+3x)^2]$, then $\dfrac{dy}{dx} = ?$

(f) If $y = \sqrt[5]{x+5}$, then $\dfrac{dy}{dx} = ?$

(g) Find y' given $xy = e^y - 2$.