

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	209	All except EC

Examination	Date	Pages
Final	December 2015	2

Instructors	Course Examiner
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Special Instructions

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

[14] 1. (a) Find $\lim_{x \rightarrow -4} \frac{x^2 + 28x + 96}{4x^2 + 7x - 36}$.

(b) Find $\lim_{x \rightarrow 2} \frac{4 - \sqrt{6x + 4}}{3x^2 - 12}$.

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

[14] 2. Find the derivatives of the following functions. YOU DO NOT HAVE TO SIMPLIFY.

(a) $f(x) = \frac{3^4}{\sqrt{x^7}} - 30x^2 - e^x$.

(b) $g(x) = \left(5\sqrt{x} - \frac{7}{x} + 6x - 8\right)(4x^5 - \ln(x) - e^2x)$.

(c) $h(x) = x^3 \ln(x) - \frac{4}{5x} - e^{(-x^2+7)}$

[8] 3. Use implicit differentiation to find $y' = dy/dx$

$$2x^5y^3 - 5x^3 + y^2 \ln x = 7y + 4x + 7.$$

[6] 4. Find dh if $h = x^{1.5}$, $x = 4$, and the change in the x is 0.1.

- [14] 5. Boyle's law for enclosed gases states that if the volume is kept constant, the pressure P and temperature T are related by the equation

$$\frac{P}{T} = k$$

where k is a constant. If the temperature is increasing at 3 kelvin per hour, what is the rate of change of pressure when the temperature is 250 kelvin and the pressure is 500 pounds per square inch?

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

- [6] 7. For $f(x) = x^3 - 6x^2 + 9x - 6$ find the absolute maximum and minimum, if either exists, on the interval $[-1, 2]$

- [14] 8. Graph the sales function $N(x) = 3x^3 - 0.25x^4 + 200$, over the interval $0 \leq x \leq 9$. Determine when N is increasing, when it is decreasing. Does N have a maximum? If so, find it. Does N have a point of inflection? If so, find it.

- [6] 9. Compute the following:

(a) $\int (4x^3 - 7x^5) dx$.

(b) $\int_2^3 \left(3x - \frac{6}{x} + 4e^x \right) dx$. Get the answer correct to three decimal places.

- [10] 10. Suppose that a country has Lorentz curve of the form $f(x) = x^a$ and a Gini index of 0.268. Find a .