

CONCORDIA UNIVERSITY  
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	209	All except EC
Examination	Date	Pages
Final	April 2012	3
Instructors	Course Examiner	
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Special Instructions		
▷ Ruled booklets to be used.		
▷ Only approved calculators are allowed.		

MARKS

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

(A)  $\lim_{x \rightarrow 2} f(x)$

(B)  $\lim_{x \rightarrow -1} f(x)$

(b) Given that  $\lim_{x \rightarrow 2} g(x) = -3$  and  $\lim_{x \rightarrow 2} h(x) = 3$ , find the

$$\lim_{x \rightarrow 2} \sqrt{h(x) - g(x)}$$

(c) If  $\lim_{x \rightarrow 4} k(x) = 4$ , then  $\lim_{x \rightarrow 5} k^2(x) = 16$ . True or False. Explain your answer.

[10] 2. (a) If  $g(x) = 2x^3 - 3x^4 - x\sqrt{x}$ , find  $g'(x)$ .

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

(c) If  $y = e^\pi$ , find  $y'$ .

(d) Find  $y'$  if  $xy^2 = e^y$ .

(e) If  $y = \sqrt[3]{x^4 + 2}$ , then  $y' = ?$

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

$$x + 500p = 10,000$$

- (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  $y = x^2 - 3x + 2$ . Suppose  $x = -3$ ,  $\Delta x = dx = -0.1$ .

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

- [9] 5. The total profit (in dollars) from the sale of  $x$  lawn mowers is

$$P(x) = 30x - 0.03x^2 - 750 \quad 0 \leq x \leq 1,000$$

- (a) Find the average profit per mower if 50 mowers are produced.
- (b) Find the marginal average profit at a production level of 50 mowers, and interpret the results.
- (c) Use the results from parts (a) and (b) to estimate the average profit per mower if 51 mowers are produced.

- [9] 6. A point is moving on the graph of  $x^2 + 2y^2 = 41$ . When the point is at  $(3, -4)$ , its  $y$  co-ordinate is decreasing by 3 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)  $\int_1^3 \left(3x + 2e^x - \frac{7}{x}\right) dx$

(b)  $\int_0^5 \frac{5x}{x^2 + 7} dx$

[12] 8. Compute the following:

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

(b)  $\int (5x^6 - 2x^3) dx$

(c)  $\int (x - 8)^{-8} dx$

(d)  $\int (x^3 - ex) dx$

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

(f)  $\int \frac{5x^3}{7 - x^4} dx$

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

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

$$h(x) = \frac{4x}{x-2}$$

State all pertinent information and sketch the graph of  $h$ .

[4] 11. Suppose  $f$  is continuous at  $x = 3$ . Decide if  $f$  must be differentiable at  $x = -3$ .

[5] 12. Two countries have the same Lorenz Curve. What conclusion can you draw from this information?