

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	209/4	All	
Examination	Date	Time	Pages
Midterm	March 2015	1 Hour 30 minutes	2
Instructors	Course Examiner		
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Special Instructions:

- ▷ Answer all questions.
- ▷ Only approved calculators are allowed.

MARKS

- [3 × 3] 1. Find limits:

(a) $\lim_{x \rightarrow 8} \frac{5 - \sqrt{17 + x}}{2x - 16}$ (b) $\lim_{x \rightarrow -2} \frac{-4(x + 2)}{8 + x^3}$ (c) $\lim_{x \rightarrow \infty} \frac{12x^3 + 10x - 5}{4x^3 + 5x}$

- [6] 2. Let $g(x) = 5x - 2x^3$. Work out the following in detail:

$$g'(x) = \lim_{t \rightarrow 0} \frac{g(x+t) - g(x)}{t}$$

- [4 × 3] 3. (a) If $f(x) = 5\sqrt{x^5} - \frac{1}{x^4}$, find $f'(1)$. Simplify.
 (b) If $g(x) = [1 + 5\ln(x^4)][3x^8 - 4]$, find $g'(2)$. You need not simplify.
 (c) Find $h'(x)$ if $h(x) = \frac{3x^3 - 4}{x^3 + 5}$. You need not simplify.
 (d) Find the value of dy if $y = x \ln(2x - 5)$, $x = 3$, and the change in x is 0.5.
- [2 × 4] 4. An experiment was set up to find a relationship between weight and systolic blood pressure in children. Using hospital records for 5,000 children, the experimenters found that the systolic blood pressure was given approximately by

$$P(x) = 17.5(1 + \ln x); 10 \leq x \leq 100 \quad [10, 100]$$

where $P(x)$ is measured in millimeters of mercury and x is measured in pounds.

- (a) What is the rate of change of blood pressure with respect to weight at the 40-pound weight level?
- (b) Find the weight at which the rate of change of blood pressure with respect to weight is 0.3 millimeter of mercury per pound.

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- [3 × 3] 5. The total cost (in dollars) of producing x HDTVs is:

$$C(x) = 10,000 + 200x - \frac{1}{10}x^2$$

- (a) Find the total cost and the marginal cost at a production level of 100 TV's.
 - (b) Use the marginal cost to approximate the cost of producing the 101st TV.
 - (c) Find the exact cost of producing the 101st TV.
- [6 + 2] 6. Find x' for the function $x(t)$ defined implicitly below. Compute the equation of the tangent line at the indicated point.

$$t \ln x = xe^t - 1; (t, x) = (0, 1)$$

- [8] 7. A point is moving on the graph of $4x^2 + 9y^2 = 180$. When the point is at $(3, 4)$, its y -coordinate is decreasing by 2 units per second. How fast is its x -coordinate changing at that moment?