

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	209/4	All except EC	
Examination	Date	Time	Pages
Final	April 2015	3 Hours	2
Instructors	Course Examiner		
A. Kokotov, B. Rhodes, C. L. Santana, F. Balogh, F. Navarro F. Romanelli, D. Sen L. Dube, M. Padamadan, V. Kalvin			

Special Instructions:

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

MARKS

[9] 1. Find the following limits:

$$(a) \lim_{x \rightarrow 3^-} \frac{x-3}{|x-3|} \quad (b) \lim_{x \rightarrow 7} \frac{(x-7)^2}{x^2-4x-21} \quad (c) \lim_{x \rightarrow -\infty} \frac{2x^3}{3(x-2)^2}$$

[18] 2. Find the derivative for each of the following (do not simplify):

$$(a) y = x^{-\frac{2}{3}} - 3x^{-4}$$

$$(b) y = 9x^{\frac{1}{3}}(x^3 + 5)$$

$$(c) y = \frac{x^2 - 3x + 1}{x^2 - 1}$$

$$(d) y = (1 + e^x) \ln x$$

$$(e) y = \frac{2\sqrt{x}}{x^2 - 3x + 1}$$

$$(f) y = [\ln(x^2 + 3)]^{\frac{3}{2}}$$

[6] 3. Use implicit differentiation to find $y' = \frac{dy}{dx}$ for $x \ln y + 2y = 2x^3$.

[6] 4. The average pulse rate y (in beats per minute) of a healthy person x inches tall is given approximately by

$$y = \frac{590}{\sqrt{x}} \quad ; \quad 30 \leq x \leq 75$$

Approximately how will the pulse rate change for a change in height from 64 to 65 inches?

- [12] 5. Given $f(x) = 2x^3 - 3x^2 - 36x$ find:
- the critical value(s) of f .
 - the interval(s) where $f(x)$ is increasing;
 - the interval(s) where $f(x)$ is decreasing;
 - the local maxima and minima.
- [6] 6. Given $g(x) = -x^4 + 12x^3 - 12x + 24$ find:
- the interval(s) where $g(x)$ is concave upward;
 - the interval(s) where $g(x)$ is concave downward;
 - the inflection point(s);
- [6] 7. Find the absolute extrema of $f(x) = x^4 - 4x^3 + 5$ on the interval $[-1, 2]$.
- [9] 8. Evaluate the following; answers must be accurate to 3 decimals:
- $\int_{-1}^0 x^2(2 + x^3)^{-2} dx$
 - $\int_{-1}^1 \frac{e^{-x} - e^x}{(e^{-x} + e^x)^2} dx$
 - $\int_0^5 \frac{x}{(x^2 + 10)} dx$
- [10] 9. Compute the antiderivatives:
- $\int \frac{x}{\sqrt{x-3}} dx$
 - $\int \frac{x^3}{\sqrt{2x^4+3}} dx$
 - $\int 4x^2\sqrt{x^3+5} dx$
 - $\int \frac{e^x}{(e^x+2)^2} dx$
- [10] 10. Find the area bounded by $y = x^3 - 3x^2 - 9x + 12$ and $y = x + 12$.
- [8] 11. A 17-foot ladder is placed against a wall. If the foot of the ladder is pushed toward the wall at 0.5 foot per second, how fast is the top of the ladder rising when the foot is 8 feet from the wall?

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