

AN eCONCORDIA EXAMINATION

CONCORDIA UNIVERSITY

Department of Mathematics & Statistics

| Course | Number | Section |
|-------------------|---------------|-------------------|
| Mathematics | 209/2 | EC |
| Examination | Date | Pages |
| Alternate | December 2014 | 2 |
| Instructors | | Course Examiner |
| Dr. Hal Proppe | | Dr. Hal Proppe |
| Dr. Fred E. Szabo | | Dr. Fred E. Szabo |

Special Instructions

- ▷ **Only approved calculators are allowed.**

Evaluation

- ▷ **The examination counts for 50% towards your final grade.**

MARKS

- [9] 1. Find the following limits:

(a) $\lim_{x \rightarrow 3^-} \frac{x-3}{|x-3|}$ (b) $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x^2 - 7x + 10}$ (c) $\lim_{x \rightarrow -\infty} \frac{2x}{3x - 6}$

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

(a) $y = 8x^{\frac{3}{4}} + 4x^{-\frac{1}{4}}$

(b) $y = \frac{5}{x^{0.3}} - 4x^{2.2}$

(c) $y = x^2 \left(1 - \frac{9}{x^3}\right)$

(d) $y = (1 + e^{x^2+3x+1}) \ln x$

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

(f) $y = 3 \ln x + 2 \log_3 x$

- [6] 3. Use implicit differentiation to find $y' = \frac{dy}{dx}$ for $e^{xy} = x^2 + y + 1$.

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

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

(a) Calculate Elasticity E.

(b) Currently the price of a hamburger is \$3.00. If the price is increased by 10% use the answer in (a) to find whether revenue will increase or decrease.

- [12] 5. Given $f(x) = x^3(x - 5)^2$ find:
- (a) the critical values of f .
 - (b) the intervals where $f(x)$ is increasing;
 - (c) the intervals where $f(x)$ is decreasing;
 - (d) the local maxima and minima.
- [6] 6. Given $g(x) = 8e^x - e^{2x}$ find:
- (a) the intervals where $g(x)$ is concave upward;
 - (b) the intervals where $g(x)$ is concave downward;
 - (c) the inflection point(s);
- [6] 7. Find the absolute extrema of $f(x) = 2x^3 - 3x^2 - 12x + 24$ on the interval $[-2, 1]$.
- [9] 8. Evaluate the following; answers must be accurate to 3 decimals:
- (a) $\int_{-4}^1 \sqrt{5-x} \, dx$
 - (b) $\int_6^7 \frac{\ln(x-5)}{x-5} \, dx$
 - (c) $\int_0^3 \frac{x}{1+x^2} \, dx$
- [10] 9. Compute the antiderivatives:
- (a) $\int \frac{x+1}{2x^2+4x+4} \, dx$
 - (b) $\int x^2(5x^3 + 5)^{-2} \, dx$
 - (c) $\int (4x + 2e^x + 5x^{-1}) \, dx$
 - (d) $\int \frac{e^x}{(e^x+3)^2} \, dx$
- [10] 10. Find the area bounded by $y = x^3 - 6x^2 + 9x$ and $y = x$.
- [4] 11. For a particular person learning to swim, the distance y (in feet) that the person is able to swim in 1 minute after t hours of practice is given approximately by

$$y = 50(1 - e^{-0.04t})$$

What is the rate of improvement (to two decimal places) after 50 hours of practice?

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