UNIVERSITÉ D'OTTAWA • UNIVERSITY OF OTTAWA
Sciences • Science
Mathématiques et statistique
Mathematics and Statistics

Calculus III for Engineers
MAT 2322A - Fall 2010
Midterm I
Professor: Victor G. LeBlanc
Time limit: 80 minutes. Closed books. No calculators.

Name:_____

ID Number:_____

Instructions

- You have 80 minutes to complete the test.
- You are not allowed to use any books, course notes, calculators, cell phones, pagers or other electronic devices.
- Read each question carefully before answering.
- There are 4 questions, and each requires a full, clearly-written and detailed solution. Answer each question in the space provided, using backs of pages or the extra pages at the end if necessary.
- Do not unstaple the test.
- Good luck!

1. (10 marks) Find and classify all critical points of the function

$$f(x, y) = x^3 - 3x + y^3 - 3y$$

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2. (10 marks) Let

$$z = f(x, y) = e^{3x+y} \sin xy$$

If $x = x(u, v) = 2v - 3u$ and $y = y(u, v) = v + uv$, compute both $\dfrac{\partial z}{\partial u}$ and $\dfrac{\partial z}{\partial v}$ **using the Chain Rule**. Your final answers should be functions of u and v alone.

3. (10 marks) Find the global maximum and the global minimum of the function

$$f(x, y) = x^2 + 2y^2$$

on the set

$$x^2 + y^2 \leq 4.$$

NOTE: For part of the solution, you are required to use the method of Lagrange multipliers.

4. (10 marks) Compute the following double integral

$$\iint_R (x^4 + 3x^2y^2)\, dA$$

where R is the rectangle $0 \leq x \leq 1$, $0 \leq y \leq 2$.

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