Math 126 C - Spring 2011
Exam 2
May 12, 2011

Name: _____

Section: _____

Student ID Number: _____

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- You are allowed to use a scientific calculator (**NO GRAPHING CALCULATORS**) and one **hand-written** 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- Check that your exam contains all the problems listed above.
- Clearly put a box around your final answers and cross off any work that you don't want us to grade.
- Show your work. The correct answer with no supporting work may result in no credit. Guess and check methods are not sufficient, you must use appropriate methods from class.
- Unless otherwise indicated, your final answer should be given in exact form whenever possible.
- Cheating will not be tolerated. Keep your eyes on your exam!
- You have 50 minutes to complete the exam. Use your time effectively, spend less than 10 minutes on each page and make sure to leave plenty of time to look at every page. Leave nothing blank, show me what you know!

GOOD LUCK!

1. (a) (6 pts) Use the linear approximation to $g(x,y) = \dfrac{\sqrt{x^3+1}}{2y} + e^{xy}$ at $(0,1)$ to approximate the value of $g(0.1, 0.9)$.

(b) (8 pts) Consider the surface $f(x,y) = xy^2 + x + 2$. Find the absolute maximum and minimum over the region $R = \{(x,y) \mid y \geq 0, x^2 + y^2 \leq 8\}$.

2. (10 pts) Let $f(x, y) = x^2y - 9y - xy^2 + y^3$. Find and classify all critical points of $f(x, y)$. (Classify using appropriate partial derivative tests).

3. (a) (8 pts) Evaluate: $\int_0^{\frac{\pi}{2}} \int_{2y}^{\pi} \sin(x^2)\, dxdy.$

(b) (8 pts) Set up and evaluate a double integral in polar coordinates in order to find the volume of the solid that is within the cylinder $x^2 + y^2 = 4$, above the plane $z = 1$, and below the surface $z + y - x^2 - y^2 = 3$.

4. (10 pts) You are sitting at the origin with a water balloon of mass 1/2 kg and a water balloon cannon. Your math instructor is sitting on the xy-plane at the point $(0, 50, 0)$, in meters. The water balloon cannon always fires with an initial (vertical) z-component of velocity of 4 m/s.

   There is a steady wind that blows with a constant force of $\langle 3, 0, 0 \rangle$ Newtons. Assume the force from the wind and the force due to gravity (with $g = 9.8$ m/s^2) are the only forces acting on the water balloon when it is in the air.

   At what initial velocity vector should you fire the cannon, so that the water balloon will land on your instructor? (That is, what are the x and y components of the initial velocity vector).