

Name:

ID:

Math 205: Midterm 2

April 10, 2008

The exam is all partial credit. Please write neatly and clearly, showing all of your work. No calculators, cell phones, books, or notes may be used. The test contains 100 possible points. Good luck!

1	
2	
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7	
Total	

1. (15 points) Let $f(x, y) = x^{3/2} \sin y$.
 - a. Find the 2nd-order Taylor polynomial for $f(x, y)$ at the point $(1, 0)$.
 - b. Use part (a) to approximate $\sqrt{1.1^3} \sin(-.1)$

2. (20 points) Let $f(x, y) = x^3y + 12x^2 - 8y$. Find all critical points of f and classify their behavior (i.e. determine if a critical point is a local minimum, maximum, saddle, or if it cannot be determined).

3. (20 points) Consider the function $f(x, y) = x^2y$. Find the absolute maximum and minimum values of f on the bounded region

$$x^2 + 2y^2 \leq 16.$$

4. (10 points) *In the following problem, you do not have to solve for a final answer. You only have to translate the question into solving a system of algebraic equations.*

The base of an open-top aquarium with given volume V is made of slate and the sides are made of glass. If slate costs five times as much (per unit area) as glass, set up a problem to find the dimensions of the aquarium that minimize the cost of the materials. Be sure to

- a. Draw a picture.
- b. Identify and label your variable names.
- c. Take any necessary derivatives.
- d. Note what your system of equations will tell you.

5. (10 points) Find the volume of the 3-dimensional region bounded by the planes

$$x = 0, x = 1, y = 0, y = 2, z = 0, z = 3x + 4y.$$

6. (10 points) Compute the integral

$$\iint_D x^3 y^2 dA$$

where $D = \{(x, y) \mid 0 \leq x \leq 2, -x \leq y \leq x\}$.

7. (15 points) Compute the integral

$$\int_0^4 \int_{y/2}^2 \sin(x^2) dx dy$$

by

- a. Drawing the region being integrated over.
- b. Switching the order of integration and then integrating.