MATH 230

MIDTERM II

November 10, 2005

NAME _____

STUDENT NUMBER _____

INSTRUCTOR _____

SECTION NUMBER _____

This exam has 13 problems. The point value for each question appears next to the each question . There are 100 total points. Present your work clearly for ALL problems. **No credit will be given for unsupported answers.**

THE USE OF CALCULATORS, BOOKS, NOTES ETC.

DURING THIS EXAMINATION IS PROHIBITED.

Check the examination booklet before you start.There should be 13 problems on 10 pages.

Do not write in the blanks below.

1. _____(7 pts)
2. _____(8 pts)
3. _____(6 pts)
4. _____(8 pts)
5. _____(8 pts)
6. _____(9 pts)
7. _____(10 pts)
8. _____(9 pts)
9. _____(9 pts)
10. _____(7 pts)
11. _____(7 pts)
12. _____(7 pts)
13. _____(5 pts)

TOTAL _____

7 pts 1. Find the limit, if it exists, or show that the limit does not exist

$$\lim_{(x,y)\to(0,0)} \frac{x^2y^2\cos y}{2x^4+y^4}.$$

8 pts 2. Set up the integral

$$\int_0^1 \int_{\sqrt{y}}^1 x^3 \sin(y^3)\, dxdy$$

by reversing the order of integration.
(Do **not** evaluate the integral)

6 pts 3. Find the linearization $L(x, y)$ of $f(x, y) = \dfrac{x}{3y}$ at the point $(6, 1)$

8 pts 4. At a certain instant, the dimensions of a rectangular box are given by $l = 3$ m, $w = 2$ m and $h = 1$ m. If the length l increases at a rate of 2 m/s while both the width w and the height h decrease at a rate of 1 m/s, then find the rate at which the volume V is changing?

8 pts 5. Find the maximum rate of change of $f(x, y, z) = x^2y + e^{2z}$ at $(2, 1, 0)$ and the direction in which it occurs.

9 pts 6. Find and classify the critical points of the function

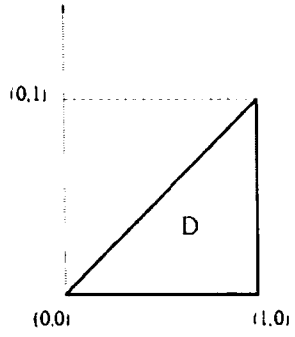
$$f(x, y) = \frac{1}{3}x^3 - x^2 + \frac{1}{2}y^2 - 8x - 3y + 9.$$

10 pts 7. Use the method of Lagrange multipliers to find the maximum and minimum values of the function

$$f(x, y) = 4x + 6y$$

subject to the constraint $x^2 + y^2 = 13$.
(**NO credit** will be given if Lagrange multipliers method is **not** used)

9 pts 8. Evaluate $\iint_D x + y \, dA$ where D is defined as below



9 pts 9. Evaluate $\iint_D xy\, dA$ where $D = \{(x, y) | x^2 + y^2 \leq 9\}$

7 pts 10. Set up the double integral that gives the area of the part of surface of $z = \frac{2}{3}(x^{3/2} + y^{3/2})$ above $\{(x, y) | -1 \leq x \leq 1, -1 \leq y \leq 1\}$.
(Do **not** evaluate the integral)

7 pts 11. Set up the double integral to find the volume of the region below $2x+y+z=4$ and above the square $\{(x,y)|0 \leq x \leq 1, 0 \leq y \leq 1\}$ on the xy plane.
(Do **not** evaluate the integral)

7 pts 12. Set up the integral

$$\iiint_E z \, dV$$

E being the solid half ball $E = \{(x,y,z)|x^2+y^2+z^2 \leq 1, z \geq 0\}$ by changing to spherical coordinates.
(Do **not** evaluate the integral)

5 pts 13. Find the Jacobian of the transformation:

$$u = x + 2y, v = x - 2y$$