Math 16C
Kouba
Exam 2

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Print your name here. Your HW #

1. Please do not turn this page until told to do so.

2. No notes, books, or classmates may be used as resources for this exam. You may *NOT* use a calculator.

3. Read directions to each problem carefully. Show all work for full credit. In most cases, a correct answer with no supporting work will *not* receive full credit. *What* you write down and *how* you write it are the most important means of your getting a good score on this exam. Neatness and organization are also important.

4. Stay calm and put forth your best effort on this exam.

5. Don't be overly alarmed by problems that you cannot immediately solve. Just maintain your composure and work at a steady rate.

6. Make sure that you have eight (8) pages, including the cover page.

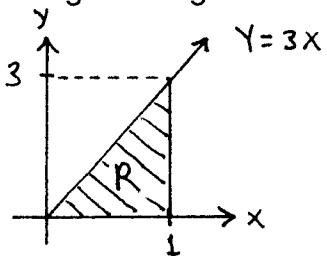
7. You have until 8 : 50 o'clock sharp to finish the exam.

1.) (12 pts) Compute z_x, z_y, and z_{xy} for $z = x\,y^3 + \tan(x - y)$.

2.) (12 pts.) Evaluate $\int_0^1 \int_0^{\sqrt{x}} (2x^2 y - 3)\, dy\, dx$.

3.) (12 pts.) Evaluate $\int_0^8 \int_{y^{1/3}}^2 \frac{6y}{\sqrt{1+x^7}}\, dx\, dy$. HINT : Switch the order of integration.

4.) (12 pts.) Find the average value of $f(x, y) = \cos(3x - y)$ over the region R given in the diagram.



5.) Consider the equation $z = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

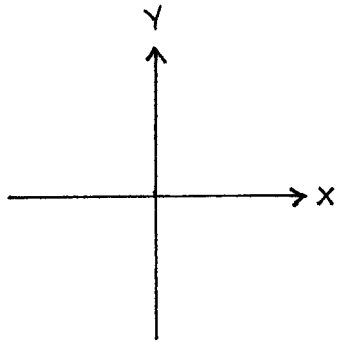
a.) (10 pts.) Find all critical points for z . (HINT : There are four !)

b.) (6 pts.) Classify each critical point in part a.) as that which determines a maximum value, minimum value, or saddle point.

6.) (12 pts.) Use Lagrange multipliers to minimize $S = x^2 + 2y^2 + 3z^2$ subject to the constraint $3x - 2y + z = 6$.

7.) Consider the function $f(x, y) = \ln(9 - x^2 - y^2)$.

a.) (6 pts.) Determine the domain of f and sketch the domain on the given axes.



b.) (4 pts.) Determine the range of f.

8.) (14 pts.) The cost for the top, bottom, and sides of a closed rectangular box are \$2/ft.^{2} , \$6/ ft.^{2} , and \$3/ft.^{2} , resp. Find the length (x), width (y), and height (z) of the least expensive box with volume 36 ft.^{3}

EXTRA CREDIT PROBLEM -- The following problem is worth 10 extra credit points and is *optional* .

Find the minimum distance from the origin to the cone given by the equation

$$z^2 = (x-1)^2 + (y-2)^2 .$$