Math 164: Multidimensional Calculus

Midterm 2

November 17, 2015

NAME (please print legibly): ______________________________

Your University ID Number: ______________________________

Indicate your instructor with a check in the appropriate box:

Bobkova	TR 12:30-1:45pm	
Chen	MW 3:25-4:40pm	
Dummit	TR 3:25-4:40pm	
Salur	MWF 09:00-09:50am	

- You are responsible for checking that this exam has all 9 pages.
- No calculators, phones, electronic devices, books, notes are allowed during the exam.
- Show all work and justify all answers.
- Please sign the pledge below.

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam, and that all work will be my own.

Signature: ______________________________

QUESTION	VALUE	SCORE
1	8	
2	8	
3	12	
4	15	
5	14	
6	14	
7	14	
8	15	
TOTAL	100	

1. (8 points) Suppose the equation $x^2z^4 + 2ye^{x+z} = 5$ defines z implicitly as a function of x and y. Find the value of $\dfrac{\partial z}{\partial x}$ at the point $(x, y, z) = (-1, 2, 1)$.

2. (8 points) Find an equation for the tangent plane to the surface $xy^2z + \ln(x + 2y + z) = 2$ at the point $(x, y, z) = (2, -1, 1)$.

3. (12 points) Consider the function $f(x, y) = xy^2$ and the point $P(1, 2)$.

(a) Find the rate of change of f at P in the direction of the vector $\mathbf{u} = \left\langle \frac{\mathbf{2}}{\sqrt{\mathbf{13}}}, \frac{\mathbf{3}}{\sqrt{\mathbf{13}}} \right\rangle$.

(b) Find the maximal rate of change of f at P and the direction in which it occurs.

4. (15 points) Find the absolute minimum and maximum values of the function $f(x, y) = 4x + 6y - x^2 - y^2$ on the region $D = \{(x, y) : 0 \leq x \leq 4, 0 \leq y \leq 5\}$.

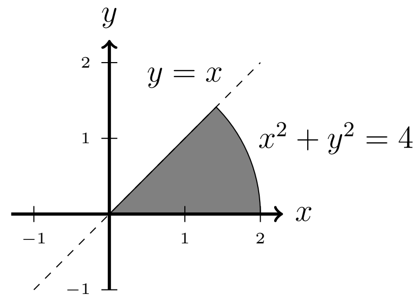
5. (14 points) Find the greatest and smallest values of $f(x, y) = 2xy$ on the ellipse $\dfrac{x^2}{4} + y^2 = 1$.

6. (14 points) Evaluate the double integral

$$\int_0^1 \int_0^2 xye^{xy^2}\,dx\,dy.$$

7. (14 points) Evaluate $\iint_R y\,dA$ where R is the triangular region with vertices $(0,0)$, $(3,0)$, and $(1,1)$.

8. (15 points) Consider the integral $I = \iint_R (x^2 + y^2)^4 \, dA$ where R is the region above the line $y = 0$, below the line $y = x$, and inside the circle $x^2 + y^2 = 4$, as pictured below:



(a) Set up (no need to evaluate) an iterated double integral for I in rectangular xy-coordinates with your choice of integration order.

(b) Evaluate the double integral in polar $r\theta$-coordinates.

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