

MULTIVARIABLE CALCULUS

November 5, 2009

INSTRUCTOR: Anar Akhmedov

Name: _____

Signature: _____

ID #: _____

Show all of your work. No credit will be given for an answer without some work or explanation.

Problem	Points
1	
2	
3	
4	
5	
6	
7	
8	
Total (105 points)	

1. Let $g(x, y) = x^3 + y^3 + 3xy + 3$. Find the critical points of $g(x, y)$. Use the second derivative test to determine the local maximum, local minimum, and saddle points of $g(x, y)$. (15 points)

2. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y, z) = xyz$ subject to the constraint $x + y + z = 1$, $x \geq 0$, $y \geq 0$, $z \geq 0$. (15 points)

3. Let D be a portion of the circular disk of radius 2 (centered at $(0,0)$) that is in the first octant of (x,y) -plane. Find the double integral $\iint_D \frac{xy}{x^2+y^2} dA$. (15 points)
4. Let D be the region bounded by $x = y^2$ and $y = x^2$. Find the double integral $\iint_D (x^2+y) dA$. (12 points)

5. Find the mass of the lamina that occupies the region D bounded by $y = 3x$ and $y = 6x - x^2$ if the density function is $\rho = xy$. (15 points)

6. Sketch the region D of integration in the following double integral $\int_0^1 \int_{3y}^3 e^{x^2} dx dy$. Evaluate the given integral by reversing the order of integration. (15 points)

7. Let R be the square $-2 \leq x \leq 2, -2 \leq y \leq 2$ in the (x, y) -plane. If $f(x, y)$ is a continuous function, and satisfies $0 \leq f(x, y) \leq 1 + x^2$, what does this tell you about the value of $\iint_R f(x, y) dA$? (10 points)

8. Determine the area of the region that lies inside $r = 3 + 2 \sin(\theta)$ and outside $r = 3$. (8 points)