

# MATH 2550

Midterm Exam 2

November 8, 2006

**NAME (please print legibly):** \_\_\_\_\_

Please complete all 5 questions in the space provided. You may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully, and try to complete the problems you find easier before going back to the harder ones.

Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
<b>TOTAL</b>	<b>50</b>	

**1. (10 points)** Find an equation for the tangent plane to the function  $f(x, y) = e^x \cos y$  at  $(0, 0)$  in the form  $z = P(x, y)$ . Use this formula to estimate  $f(0.2, 0.2)$ .

ANSWER: \_\_\_\_\_

Bonus (5pts): Find the second degree (or quadratic) Taylor approximation to  $f(x, y)$  and use it to estimate  $f(0.2, 0.2)$ .

ANSWER: \_\_\_\_\_

**2. (10 points)** Find all of the local maxima, local minima, and saddle points of the function

$$f(x, y) = 3y^2 - 2y^3 - 3x^2 + 6xy.$$

ANSWER: \_\_\_\_\_

**3. (10 points)** Find the maximum value of the function  $f(x, y, z) = x^2y^2z^2$  on the sphere  $x^2 + y^2 + z^2 = 1$  using Lagrange multipliers.

ANSWER: \_\_\_\_\_

**4. (10 points)** Sketch the region of integration for the integral

$$\int_0^\pi \int_x^\pi \frac{\sin y}{y} dy dx.$$

Then reverse the order of integration and do the integral. (Hint: You will probably not be able to do the integral without changing the order of integration.)

ANSWER: \_\_\_\_\_

**5. (10 points)** Find the volume of the solid shown in the figure below. It is bounded on the bottom by the  $xy$  plane, on the sides by the sphere centered at the origin of radius 2 and on the top by a cone which makes an angle of  $\pi/3$  radians with the  $z$ -axis. (Hint: Integrate in spherical coordinates.)

