Math 241
Vector Calculus
Fall 2000, USC

Nov 17, 2000

MIDTERM 3

Time: 50min

1. Find the equation of the tangent plane to the surface $x^2 - y^2 + z^2 + 1 = 0$ at the point $(1, 3, \sqrt{7})$.

2. Find the maximum and minimum values of $f(x, y) = x^2 - y^2$ over $D = \{(x, y) : x^2 + y^2 \leq 1\}$.

3. What are the dimensions of the rectangular box, open at the top, which has maximum volume when the surface area is 48?

4. Evaluate $\int\int_S (x + y)\, dA$, where S is the triangular region with vertices $(0, 0)$, $(0, 4)$, and $(1, 4)$.

5. Find the area of the region inside the circle $(x - 2)^2 + y^2 = 4$ and outside the circle $x^2 + y^2 = 4$ (*Hint:* change to polar coordinates).

Each problem is worth 20 points

LaTeX ..... $\mathcal{MG}$