

QUIZ 2
(16 Oct 2008)

NAME:

Problem 1. Consider the function $f(x, y) = 1 + x\sqrt{x+y}$.

- (1) (7 pt) Find the gradient ∇f at the point $(1, 2)$;
- (2) (10 pt) Find the rate of change of f at the point $(1, 2)$ in the direction of the vector $\langle 3, 4 \rangle$; (3 pt) Is it true that the value of f increases when, starting at $(1, 2)$, you move in the direction $\langle 3, 4 \rangle$?
- (3) (5 pt) Find the maximal rate of change of f at the point $(1, 2)$ and the direction in which it occurs.

Problem 2. (20 pt) Find an equation of the tangent plane to the parametric surface

$$\vec{r}(u, v) = \langle 2 + u^2v^2, u^2 + v, v \rangle$$

at the point $\vec{r}(1, 1) = (3, 2, 1)$.

Problem 3. (25 pt) Find the local maximums, minimums, and the saddle points (if any) of the function $f(x, y) = x^3 + y^3 - 3xy + 4$.

Problem 4. (30 pt) Find the minimum and the maximum of the function $f(x, y) = x^2 - y^2$ subject to the constraint $\frac{x^2}{4} + 2y^2 = 1$.