## FALL 2008 — MA 227-7 B — TEST 2

Name: _____

## 1. PART I

There are 6 problems in Part 1, each worth 4 points. Place your answer on the line to the right of the question. Only your answer on the answer line will be graded.

(1) Find the directional derivative in direction $v = <1, 2>$ of the function $f(x, y) = xy^2$ at the point (1,1).

_____

(2) Find the gradient of the function $f(x, y) = 2y/x$.

_____

(3) Find the linearization $L(x, y)$ of $f(x, y) = 2xy^2 - 7$ at the point (1,2).

_____

(4) What is the direction of steepest ascent of the function $h(x, y) = xy$ at the point $P(2, 1)$?

_____

(5) The gradient of a function $f$ is given by $\nabla f = \langle y - 2x^2, 4 - 2y \rangle$. Find all the critical points of $f$.

_____

(6) Find the tangent plane to the sphere $x^2 + y^2 + z^2 = 1$ at the point $(0, 1, 0)$.

## 2. Part II

There are 3 problems in Part 2, each worth 12 points. On Part 2 problems partial credit is awarded where appropriate. Your solution must include enough detail to justify any conclusions you reach in answering the question.

(1) Find the points on the ellipsoid $x^2+2y^2+3z^2 = 15$ where the tangent plane is parallel to the plane $x - 2y + 6z = 7$.

(2) Use Lagrange multipliers to find the minimal and maximal values of $f(x, y) = 8x + 6y$ on the ellipse $2x^2 + 3y^2 = 22$. Where do they occur?

(3) Find and classify all critical points of of the function $f(x, y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 2$.