## MATH 222 SPRING 2017

EXAM 2

Your name: Recitation instructor name: Recitation time:

| Problem | 1 | 2 | 3 | 4 | 5 | Total |
|---------|---|---|---|---|---|-------|
| Grade   |   |   |   |   |   |       |

**Problem 1.**(20 pts) Let  $f(x, y) = x^3 + 2xy + 3y^2$ . a) Find an equation of the plane tangent to the surface z = f(x, y) at the point (1, -1, 2).

b) Use part a) to estimate f(1.01, -1.02).

## EXAM 2

**Problem 2.** (20 pts) Let  $f(x, y) = x^3 + 3xy - 2y^2$ . a) Find the directional derivative of f(x, y) at the point (1, 1) in the direction of the vector v = 4i - 3j.

b) Find the direction of the most rapid increase of f(x, y) at the point (1, 1) and the directional derivative in that direction.

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**Problem 3.** (20 pts) Let function z = f(x, y) be given implicitly by the equation

$$x^3 + xz = z^3 + 2yz$$

Find the gradient of f(x, y) at the point (2, 1).

**Problem 4.** (20 pts) Find and classify (as a local maximum, a local minimum or a saddle) the critical points of the function

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

**Problem 5.** (20 pts) Find the maximum and minimum values of the function  $f(x, y) = 3x^2 + 4xy$ , subject to constraint  $x^2 + y^2 = 5$ .