

# Math 2415

## Homework on 14.7 (Local)

1. Find and classify the critical points of  $f(x, y) = x^3 + y^3 - 3x^2 - 6y^2$ .
2. Find and classify the critical points of  $f(x, y) = -3x^2 - 4xy - y^2 - 12y + 16x$ .
3. Find the local maxima, minima, and saddle points, if any, of a function  $f(x, y)$  whose partial derivatives are  $f_x = 9x^2 - 9$ ,  $f_y = 2y + 4$ .
4. Find all local maxima, local minima, and saddle points of the following functions
  - (a)  $f(x, y) = 2xy - 5x^2 - 2y^2 + 4x + 4y - 4$
5. Each of the following functions has a critical point at the origin. Show that the second derivative test fails there. Determine whether the functions has a local maximum, local minimum, or saddle point at the origin by visualizing what the surface  $z = f(x, y)$  looks like. Describe your reasoning.
  - (a)  $f(x, y) = x^2y^2$
  - (b)  $f(x, y) = 1 - xy^2$