Homework Assignment for Week 10

1. Let $f(x, y) = x^2 y/(x^2 + y^2)$ for $(x, y) \neq (0, 0)$ and $f(0, 0) = 0$.

   (a) Is f continuous at $(0, 0)$?

   (b) Do f_x and f_y exist at $(0, 0)$?

   (c) Evaluate the directional derivative of f in the direction $(\cos\theta, \sin\theta)$, i.e. $df/ds_{(0,0),(\cos\theta,\sin\theta)}$, if it exists.

   (d) Is f differentiable at $(0, 0)$?

2. Section 14.7: Problems 1, 31, 35, 39, 43, 44, 49, 57.

   Hint for problem 44: try the gradient analysis we introduced in class.

3. Section 14.8: Problems 1, 23, 27, 33, 35.

4. Section 14.9: Problems 7, 9, 11.

5. Derive Taylor's formula for functions of three variables.