Math 281 Homework 6 Name: _____

Complete the following problems on your own paper. If you use notebook paper, please remove the jagged edges of the paper before submitting your homework. Your solutions must be numbered and submitted in the order the problems were given, legibly written using correct notation and including all mathematical details. If you submit work that is messy, disorganized, or lacking detail, you should expect to receive little credit regardless of having the correct final answer.

Due: 8:00am on Tuesday, November 12

1. Find the limit, if it exists. If continuity is used, explain where the function is continuous. If the limit doesn't exist, show why not.

   Note : We did not discuss the polar coordinate change of variable method for computing limits at the origin. I am not interested in seeing that approach to these limits and that solution will receive little credit.

   (a) $\lim_{(x,y)\to(1,0)} \ln\left(\frac{1-xy}{x^2+y^2}\right)$

   (b) $\lim_{(x,y)\to(1,1)} \frac{x^2-y^2}{x^4-y^4}$

   (c) $\lim_{(x,y)\to(0,0)} \frac{y\sin x}{x^2+y^2}$

   (d) $\lim_{(x,y)\to(0,0)} \frac{y^2\sin x}{x^2+y^2}$

2. The intersection of the ellipsoid $4x^2 + y^2 + 2z^2 = 10$ and the plane $x = 1$ is an ellipse. Find the the tangent line to the ellipse at the point (1, 2, -1).

3. Use implicit differentiation to compute the partial derivatives $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

$$x^2z^3 = \cos(x - y^2z)$$

4. Let $f(x,y) = \frac{\sqrt{x^2-5y}}{3y-2x}$

   (a) Find the tangent plane to the surface at the point $(4, 3, 1)$

   (b) Find the linearization of $f(x,y)$ at $(4, 3)$.

   (c) Use $L(x,y)$ to approximate $f(4.03, 2.98)$.

5. Let $f(x,y) = x^2\ln(2x-3y)$. Find the first and second order Taylor polynomials for f near the point $(2, 1)$.