Problem Set 1 Calculus 3 Due 9/28/15

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points for correct and clearly justified answers.

1. Do #67 in §12.3. Explain well why your answer makes sense.

2. Let $f(x,y)=\dfrac{xy\left(x^2-y^2\right)}{x^2+y^2}$.
   a) Find f_x and f_y.
   b) Find $f_{xy}(0,0)$ and $f_{yx}(0,0)$.
   c) Explain briefly what this has to do with Clairaut's Theorem.

3. Find an equation for the line through the origin and the point (3, 2, 1). Determine where this line intersects the hyperboloid $1 = x^2 + y^2 - z^2$, and describe the angle at which the line intersects the surface.

4. a) Show that the equation of the tangent plane to the elliptic paraboloid $\dfrac{z}{c}=\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}$ at the point (x_0, y_0, z_0) can be written as $\dfrac{2x\,x_0}{a^2}+\dfrac{2y\,y_0}{b^2}=\dfrac{z+z_0}{c}$.

   b) Find the point of intersection of this tangent plane with the z-axis, and compare it with the coordinates of the point of tangency.