MATH 11: MULTIVARIABLE CALCULUS
FALL 2018
HOMEWORK #3

Please turn in your completed homework assignment by leaving it in the boxes labeled "Math 11" in the hallway outside of Kemeny 105 anytime before 3:30 p.m. on **Tuesday, October 2**.

Problem 1. Consider the limit
$$\lim_{(x,y)\to(0,0)} \frac{xy^4}{x^2 + y^8}.$$
If it exists, find its value; if not show that it does not exist.

Problem 2. Does there exist a differentiable function $f(x, y)$ with the given partial derivatives? If so, give an example; otherwise, explain why not.

(a) $f_x = 1 - 2xy, \quad f_y = 2 - x^2$
(b) $f_x = x + y^2, \quad f_y = x - y^2$

Problem 3. Suppose S is a surface in $\mathbb{R}^3$ that can be described as the graph of a differentiable function $f(x, y)$. The curves given by $\mathbf{r_1}(t) = \langle 1 + t, t^2 - t + 2, e^t + 3 \rangle$ and $\mathbf{r_2}(s) = \langle s^2 + 2s + 2, 1 - s, 3s + 7 \rangle$ both lie on S.

(a) Find the equation of the tangent plane to S at the point $(1, 2, 4)$.
(b) Find $f_x(1, 2)$ and $f_y(1, 2)$.