

MATH 222 WRITTEN ASSIGNMENT 2

DUE TUESDAY MARCH 31

- Before attempting this assignment you are advised to solve Problems 1–6, 15–18, and 26–28 of [Webwork Assignment 4](#).
 - Provide sufficient details and explanations in full sentences and in your own words.
 - The problems here are not hard, and can be solved by combining the most basic theory with some common sense. So you are *strongly* encouraged to work on your own, without looking up solution methodologies anywhere, and without discussing the problems with anybody. Take your time and try to understand the problems fully. Please use consultation only as a last resort, and in case you consult somebody or other sources, follow the policy that is described in the previous assignment.
1. Determine if the following limits exist, and if a limit exists, find its value.
 - (a) $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y}{x^4 + y^2}$.
 - (b) $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^2}{x^2 + y^2}$.
 - (c) $\lim_{(x,y) \rightarrow (1,1)} \frac{x^3 - y^3}{x - y}$.
 2. Find the coordinates of the point (x, y, z) on the plane $z = x + y + 4$ which is closest to the origin. The solution should involve partial derivatives, and direct geometric reasonings that bypass partial derivatives are not allowed.
 3. Find the maximum and minimum values of $f(x, y, z) = 2x - y + 4z$ on the sphere $x^2 + y^2 + z^2 = 1$. Here you can use any type of reasonings, including geometric ones.
 4. Let $f(x, y) = 5x - 7y + 4xy - 7x^2 + 4y^2$ be a function defined in the unit square $0 \leq x \leq 1$, $0 \leq y \leq 1$. Find the maximum and minimum values of f and where they occur.
 5. Find the maximum and minimum values of the function $f(x, y) = 5x^2 - 22xy + 5y^2 + 8$ in the disk $x^2 + y^2 \leq 25$.
 6. Find the maximum and minimum values of
$$f(x, y) = \frac{x + y}{2 + x^2 + y^2}.$$
 7. Find the most economical dimensions of a closed rectangular box of volume 3 cubic units if the cost of the material per square unit for (i) the top and bottom is 2, (ii) the front and back is 2 and (iii) the other two sides is 8.

Date: Winter 2015.