

WORKSHEET 7
MATH1014 (CALCULUS), SPRING SEMESTER, 2020

INSTRUCTOR: ASILATA BAPAT

- (1) Find the critical points of the function $f(x, y) = x^4 - 4x^2 + y^2$ and classify them.
- (2) Find the point on the plane $x - 2y + 3z = 6$ that is closest to the point $(0, 1, 1)$, *without using Lagrange multipliers*.
- (3) Find the points on the sphere $x^2 + y^2 + z^2 = 36$ that are closest to and farthest from the point $(1, 2, 2)$, using Lagrange multipliers. Think about how you might do this without Lagrange multipliers.
- (4) Find the extreme values of f on the region described by the inequality, where

$$f(x, y) = e^{-xy}, \quad x^2 + 4y^2 \leq 1.$$

Note that you must compare the critical points in the interior with the points on the boundary obtained from the Lagrange multiplier constraint.

- (5) The plane $x - y + z = 2$ intersects the cylinder $x^2 + y^2 = 4$ in an ellipse. Find the points on this ellipse that are closest to and farthest away from the origin.