

University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
Instructor: Dr. Marco A. MONTES DE OCA
Spring 2013

Homework 7

Due date: April 1, 2013

Problems

Based on Sections 14.7–14.8 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart. **You may use Maple, or some other mathematical software, like Mathematica, or Wolfram Alpha, to solve some of the equations that will appear. A good (although old) tutorial on the use of Maple in MATH243 is <http://www.math.udel.edu/~driscoll/teaching/243/maple/index.html>.**

1. Find all the critical points of the function $f(x, y) = x^2y - xy - 2x + 3$. Say whether they are local minimizers, local maximizers, or saddle points.
2. Find all the critical points of the function $f(x, y) = x^2y + 2x^2 + y^2$. Say whether they are local minimizers, local maximizers, or saddle points.
3. Find and classify all the critical points of $f(x, y) = x^2 + axy + y^2$ when a) $a = 4$, b) $a = 2$, and c) $a = 1$. What is the effect of a on the function?
4. Find all the critical points of the function $f(x, y) = x^2y^2 - 2xy + 2x + y^2$. Say whether they are local minimizers, local maximizers, or saddle points.
5. Find the absolute minimum and maximum values of $f(x, y) = x^3y + x^2 + y^2$ in $D = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq 1\}$.
6. Find the extreme values of $f(x, y, z) = e^{xy}$, subject to the constraint $x^3 + y^3 = 16$.
7. Find the extreme values of $f(x, y, z) = 3x - y - 3z$, subject to the constraints $x + y - z = 0$, $x^2 + 2z^2 = 1$.
8. Find the extreme values of $f(x, y) = x^2 + y^2 + 4x - 4y$ on the region $x^2 + y^2 \leq 9$.
9. Find the extreme values of $f(x, y) = 2x^2 + 3y^2 - 4x - 5$ on the region $x^2 + y^2 \leq 16$.
10. The plane $4x - 3y + 8z = 5$ intersects the cone $z^2 = x^2 + y^2$ in an ellipse. Find the highest and lowest points on the ellipse.