University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
Instructor: Marco A. Montes de Oca
Spring 2012

Homework 12

Name: _____ **Section:** _____

Due date: April 17, 2012 (Section 50)
April 16, 2012 (Section 51)

Problems

Taken or adapted from the book *MATH 241/242/243 University of Delaware* by J. Stewart. Each exercise is worth 10 points for a total of 100 points.

1. Use Lagrange multipliers to find the maximum and minimum values of the function $f(x, y) = 4x + 6y$ subject to the constraint $x^2 + y^2 = 13$.
2. Use Lagrange multipliers to find the maximum and minimum values of the function $f(x, y, z) = 3x - y - 3z$ subject to the constraints $x + y - z = 0$ and $x^2 + 2z^2 = 1$.
3. Use Lagrange multipliers to prove that the rectangle with maximum area that has a given perimeter p is a square.
4. The plane $x + y + 2z = 2$ intersects the paraboloid $z = x^2 + y^2$ in an ellipse. Find the points on this ellipse that are nearest to and farthest from the origin.
5. Evaluate the double integral $\iint_R (5 - x)\,\mathrm{d}A$, $R = \{(x, y) | -2 \leq x \leq 2, 1 \leq y \leq 6\}$ by interpreting it as the volume of a solid.
6. Calculate the iterated integral $\int_0^2 \int_0^{\pi/2} x \sin(y)\,\mathrm{d}y\,\mathrm{d}x$
7. Calculate the iterated integral $\int_0^1 \int_0^3 e^{x+3y}\,\mathrm{d}x\,\mathrm{d}y$

8. Evaluate the double integral $\iint_D x^3 \, \mathrm{d}A$, $D = \{(x, y) | 1 \leq x \leq e, 0 \leq y \leq \ln(x)\}$

9. Evaluate the double integral $\iint_D (x + y) \, \mathrm{d}A$, where D is bounded by $y = \sqrt{x}$ and $y = x^2$

10. Sketch the region of integration and change the order of integration: $\int_0^1 \int_{\arctan(x)}^{\pi/4} f(x, y) \, \mathrm{d}y \, \mathrm{d}x$