# University of Delaware
# Department of Mathematical Sciences

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

Homework 4

**Name:** _____ **Section:** _____

Due date: February 28, 2012 (Section 50)
February 27, 2012 (Section 51)

## Problems

Taken or adapted from Section 12.3 of the book *MATH 241/242/243 University of Delaware* by J. Stewart. Use MAPLE to plot the surfaces involved in each problem.

Even though you must use MAPLE to complete this homework, you should have solved each problem first in your head or on paper. Only then you should use MAPLE. See the process as an instance of the scientific method: First formulate a hypothesis based on what you know. Then compare experimental data (that is, the plot) with your hypothesis to see if the data confirms or falsifies your hypothesis. If the data and the hypothesis differ, go back and improve your hypothesis. The cycle ends when your hypothesis is fully backed by empirical data. Each exercise is worth 12.5 points for a total of 100 points.

1. Exercise # 12.6–5. Describe and plot the surface described by $x - y^2 = 0$.
2. Exercise # 12.6–6. What is the name of the surface represented by $yz = 4$? Plot it.
3. Exercise # 12.6–14. What is the surface represented by $25x^2 + 4y^2 + z^2 = 100$? Plot the traces of this surface on the $xy$-, $yz$-, and $xz$-planes.
4. Exercise # 12.6–28. Identify the surface represented by $y = x^2 - z^2$. Plot it.
5. Exercise # 12.6–32. Reduce the equation $4x - y^2 + 4z^2 = 0$ to one of the standard forms (see the worksheet we used in the lab session, or see Table 1 in Section 12.6 of the book). What is the region represented by the equation? Plot it.

6. Exercise # 12.6–42. Plot the region bounded by the paraboloids $z = x^2 + y^2$ and $z = 2 - x^2 - y^2$. Hint: For each paraboloid, assign the command *implicitplot3d* to a variable. For example: `a:=implicitplot3d...;` `b:=implicitplot3d...;` Then, use the command *display* to plot both surfaces simultaneously. Example: `display(a,b);`

7. Exercise # 12.6–46. Find an equation for the surface consisting of all points $P$ for which the distance from $P$ to the x-axis is twice the distance from $P$ to the $yz$-plane. Identify and plot the surface.

8. Exercise # Review Chapter 12–38. A surface consists of all points $P$ such that the distance from $P$ to the surface $y = 1$ is twice the distance from $P$ to the point $(0, -1, 0)$. Find an equation for this surface, identify it and plot it.