University of Delaware
Department of Mathematical Sciences

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

Homework 3

Due date: February 25, 2012

Problems

Based on Sections 12.5–13.2 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. Find an equation of the plane through the point $(5, 3, 5)$ and with normal vector $2\hat{i} + \hat{j} - \hat{k}$.
2. Find an equation of the plane through the point $(2, 0, 1)$ and perpendicular to the line $x = 3t$, $y = 2 - t$, and $z = 3 + 4t$.
3. Find an equation of the plane through the points $(3, -1, 2)$, $(8, 2, 4)$, and $(-1, -2, -3)$.
4. Find an equation of the plane through the point $(-1, 2, 1)$ and contains the line of intersection of the planes $x + y - z = 2$ and $2x - y + 3z = 1$.
5. Find the point at which the line given by $x = 1 + 2t$, $y = 4t$, $z = 2 - 3t$, intersects the plane $x + 2y - z + 1 = 0$.
6. Let L_1 be the line through the points $(1, 2, 6)$ and $(2, 4, 8)$. Let L_2 be the line of intersection of the planes π_1 and π_2, where π_1 is the plane $x - y + 2z + 1 = 0$ and π_2 is the plane through the points $(3, 2, -1)$, $(0, 0, 1)$, and $(1, 2, 1)$. Calculate the distance between L_1 and L_2.
7. Write a report of 2-3 pages about Section 12.6 of the book. In particular, discuss how would you determine whether a given expression represents a quadric surface. Also discuss how once you have determined that you are in presence of a quadric surface you can know whether it is an ellipsoid, a paraboloid and so on.
8. Find a vector function that represents the intersection of the cylinder $x^2 + y^2 = 4$ and the surface $z = xy$.
9. Find parametric equations for the tangent line to the curve given by $x = e^t$, $y = te^t$, and $z = te^{t^2}$ at the point $(1, 0, 0)$.
10. Find the point on the curve $\vec{r}(t) = \langle 2\cos t, 2\sin t, e^t \rangle$, $0 \leq t \leq \pi$, where the tangent line is parallel to the plane $\sqrt{3}x + y = 1$.