

University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
Instructor: Dr. Marco A. MONTES DE OCA
Fall 2012

Homework 2

Due date: September 17, 2012

Problems

Material covered in Sections 12.3 and 12.4 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. (20 points) What are the applications of the dot and cross products when working with forces? (Study the applications subsections of Sections 12.2, 12.3, and 12.4). Write at least a page (in Word or similar application with an 11 pt font) explaining these applications. Your diagrams may be done by hand.
2. Using vectors, determine whether the triangle with vertices $A(0, 0, 1)$, $B(-2, 4, 1)$, and $C(4, 2, 1)$ is an acute triangle, an obtuse triangle or a right triangle.
3. Find the angle between the diagonal of a cube and the diagonal of one of its sides.
4. Find the work done by a force $\vec{F} = 3\hat{i} - 2\hat{j} + \hat{k}$ that moves an object from the point $(1, 2, 8)$ to the point $(6, 1, -1)$ along a straight line. The distance is measured in meters and the force in newtons.
5. Write $\vec{a} = \langle 3, 2, -6 \rangle$ as the sum of two vectors, one parallel, and one perpendicular, to $\vec{d} = \langle 2, -4, 1 \rangle$.
6. Using vectors, find the distance from the point $P(1, 2)$ to the line $4x - y + 1 = 0$.
7. Show that if $\vec{a} = \alpha\vec{b}$, then $\vec{a} \times \vec{b} = \vec{0}$.
8. Using the cross product, find the area of the triangle with vertices $A(2, -3, 4)$, $B(0, 1, 2)$, and $C(-1, 2, 0)$.
9. Find a unit vector that is orthogonal to the plane that contains the points $A(0, 1, 1)$, $B(1, 0, 1)$, and $C(1, 1, 0)$.