

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 11, 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, find the three angles of the triangle with vertices $A(0, 0, 1)$, $B(-2, 4, 1)$, and $C(4, 2, 1)$.
3. Find the angle between a diagonal of a cube and one of its edges.
4. Find the work done by a force $\vec{F} = \hat{i} - 6\hat{j} + 9\hat{k}$ that moves an object from the point $(1, 3, 8)$ to the point $(6, 1, 10)$ along a straight line. The distance is measured in meters and the force in newtons.
5. Determine the value of α so that $\vec{a} = 2\hat{i} + \alpha\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 8\hat{k}$ are perpendicular.
6. Find the distance from the origin to the line $2x - 3y + 1 = 0$. Hint: Remember our discussion in class about this!
7. If $\vec{a} = \langle 1, 3, -8 \rangle$ and $\vec{b} = \langle 3, 9, -24 \rangle$, find $\vec{a} \times \vec{b}$. Explain the result.
8. Using the cross product, find the area of the triangle with vertices $A(-1, 3, 1)$, $B(0, 5, 2)$, and $C(4, 3, -1)$.
9. Find two unit vectors that are orthogonal to both $\langle 0, 1, 2 \rangle$ and $\langle 1, -2, 3 \rangle$.