University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
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Spring 2013

Homework 1

Due date: February 11, 2012

Problems

Based on Sections 12.1–12.5 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. Determine whether the points lie on straight line:
   a) $A(2,4,2)$, $B(3,7,-2)$, $C(1,3,2)$
   b) $A(0,-5,5)$, $B(1,-2,4)$, $C(3,4,2)$
2. Find an equation of a sphere if one of its diameters has endpoints $(2,1,4)$ and $(4,3,10)$.
3. Write inequalities to describe the region between the yz-plane and the vertical plane $x = 5$.
4. Suppose $\vec{a} = \langle 1,3,2\rangle$, $\vec{b} = \langle 0,-1,8\rangle$, and $\vec{c} = \langle 1,-2,0\rangle$. Which of the following expressions are meaningful? If they are meaningful, compute them. Otherwise, explain why they are meaningless.
   a) $(\vec{a}\cdot\vec{b}\cdot\vec{c})$ b) $(\vec{a}\cdot\vec{b})\vec{c}$ c) $||\vec{a}||(\vec{b}\cdot\vec{c})$
   d) $\vec{a}\cdot(\vec{b}+\vec{c})$ e) $\vec{a}\cdot\vec{b}+\vec{c}$ f) $||\vec{a}||\cdot(\vec{b}+\vec{c})$
5. Find the values of x such that the angle between the vectors $\langle 3,4,0\rangle$ and $\langle 0,x,8\rangle$ is $60°$.
6. Show that if $\vec{u}+\vec{v}$ and $\vec{u}-\vec{v}$ are orthogonal, then the vectors $\vec{u}$ and $\vec{v}$ must have the same length.
7. Calculate $(2\vec{a}+3\vec{b})\cdot(\vec{c}-\vec{a})$ if $\vec{a} = \hat{\imath}+\hat{\jmath}-2\hat{k}$, $\vec{b} = 3\hat{\imath}-2\hat{\jmath}+\hat{k}$, and $\vec{c} = \hat{\jmath}-5\hat{k}$.
8. Determine whether the triangle whose vertices are $(2,-7,3)$, $(-1,5,8)$, $(4,6,-1)$ is an acute triangle, an obtuse triangle, or a right triangle.
9. Find the acute angle between the lines $2x - y = 3$, and $3x + y = 7$. The angle between two curves is the angle between the vectors parallel to the curves' tangent lines at the point of intersection (like in the parabola exercise in class).
10. Find the acute angle between $y = \sin x$ and $y = \cos x$, $0 \le x \le \pi/2$.