Implicit in any homework problem is that you must explain why your answer is correct, even if the problem does not ask for a formal proof. You should write in complete sentences with reasonably correct grammar. Math 5335 is not a writing intensive course, but it *is* a 5000-level mathematics course, and you're expected to be able to explain your work in a coherent, organized and logical manner.

Homework Assignment

Section 1.6: Problem 58. [Hints: (1) When working with distances you can often work with the *squares* of the distances. (2) Start with one quantity and manipulate it to match the desired expression. Don't write both of them with $\stackrel{?}{=}$ between them. (3) Work with U and V, not (u_1, u_2) and (v_1, v_2).]

Section 2.5: Problems 9, 13, 14 and 18.

Additional Problem: At the end of Chapter 2, based on our definition of the measure of an angle, we defined the arccos function and its inverse, the cosine function. The goal of this problem is to develop the "geometric definition" of the dot product which I have often referred to in class.

a: Prove the following fact about the dot/scalar/inner product, which we have used frequently:

$$\langle aU, bV\rangle = ab\langle U, V\rangle$$

b: Let U, V be unit vectors in the same direction as A and B. Prove $\langle U, V\rangle = \frac{\langle A,B\rangle}{||A||\cdot||B||}$.

c: Let p, r be rays from a common vertex with direction indicators A and B, respectively. Let θ denote the measure of $\angle(p, r)$. Use part (b) to show

$$\theta = \arccos\left(\frac{\langle A, B\rangle}{||A|| \cdot ||B||}\right)$$

Conclude that $\cos\theta = \frac{\langle A,B\rangle}{||A||\cdot||B||}$ or, equivalently, $\langle A, B\rangle = ||A|| \cdot ||B|| \cos\theta$.