MATH 223 - SECTION 011

WRITTEN ASSIGNMENT 1, FALL 2012

DUE DATE: WEDNESDAY, AUGUST 29, 2012. 1:00 PM

Please show all work on the following problems. For full credit, use correct and precise notation, and be very clear in your responses. If a question asks for a written response or explanation, use full, intelligible sentences. Vectors written in components should use $\vec{i}$, $\vec{j}$, $\vec{k}$ notation (hats are okay). Points will be taken off for vectors written without arrows over them (or hats, as mentioned above). A few of the problems will be chosen for grading.

**1.** Come up with an example showing that the projection formula doesn't work if the vector onto which you are projecting is not a unit vector (this shows why it is so important to normalize the vector onto which you are projecting!)

**2.** Using the properties of the dot product, show that

$$\left(\vec{b} \cdot \vec{c}\right) \vec{a} - (\vec{a} \cdot \vec{c})\, \vec{b}$$

is always perpendicular to $\vec{c}$.

**3.** If $\vec{u}$ and $\vec{v}$ are vectors, explain geometrically why

$$||\vec{u} + \vec{v}|| \leq ||\vec{u}|| + ||\vec{v}||\,.$$

**4.** Prove that if $\theta$ is the angle between $\vec{u}$ and $\vec{v}$ and $\vec{u} \cdot \vec{v} \neq 0$, then $\tan\theta = ||\vec{u} \times \vec{v}|| \,/\, (\vec{u} \cdot \vec{v})$.

Do the following problems from the text:

Section 13.1: # 26, 29. Section 13.2: # 18, 22 (# 25 is suggested, but not required). Section 13.3: # 33, 49, 63. Section 13.4: # 21, 28.