Problem Set #2

Due: Wednesday, January 25

1. Using vectors, prove that the diagonals of a parallelogram are perpendicular if and only if the parallelogram is a rhombus.(Note: A **rhombus** is a parallelogram whose four sides all have the same length.)

2. Suppose $\vec{u}$ and $\vec{v}$ are nonzero vectors. Show that $||\vec{v}||\vec{u} + ||\vec{u}||\vec{v}$ bisects the angle between $\vec{u}$ and $\vec{v}$. (Hint:Find the angle between $\vec{u}$ and $||\vec{v}||\vec{u} + ||\vec{u}||\vec{v}$ and the angle between $\vec{v}$ and $||\vec{v}||\vec{u} + ||\vec{u}||\vec{v}$.)

3. Let $\overrightarrow{u} = 2j$ and let $\overrightarrow{v}$ be a vector with length 9 that starts at the origin and rotates in the xy-plane. Find the maximum and minimum values of $\overrightarrow{u} \times \overrightarrow{v}$.

4. **(a)** Suppose that the area of the parallelogram spanned by the vectors $\vec{u}$ and $\vec{v}$ are 10. What is the area of the parallelogram spanned by the vectors $2\vec{u} + 3\vec{v}$ and $-3\vec{u} + 4\vec{v}$?

(b) Given $(\vec{u} \times \vec{v}) \cdot \vec{w} = 10$. What is $\Big((\vec{u} + \vec{v}) \times (\vec{v} + \vec{w})\Big) \cdot (\vec{w} + \vec{u})$?

5. Online homework 13.3 and 13.4. (Due time: Tuesday, Jan 24, 2006 12:00 AM).