1) Let $\vec{v} = \vec{i} - 2\vec{j} - \vec{k}$ and $\vec{w} = -\vec{i} + \vec{j} + 3\vec{k}$. Compute

$$\vec{v} \times \vec{w}$$

You should get $-5\vec{i} - 2\vec{j} - \vec{k}$. If you didn't, look at page 875 in the book. Find the area of the parallelogram formed from $\vec{v}$ and $\vec{w}$ in the plane they determine. Find the angle between these two vectors (using the cross product, not the dot product).

2) Find the distance from the point $P = (0, 0, 1)$ to the plane determined by $\vec{v}$ and $\vec{w}$ in the problem 1) (hint: project a vector from P to a point in the plane onto a normal vector).

3) Three points determine a plane: You are given $(-1, 0, 1)$, $(0, 1, 1)$ and $(0, 2, 3)$. We wish to find an equation for the plane through these three points. To do this, first find two vectors in the plane, and take their cross product to find a normal vector $\vec{N}$ to the plane. Let $\vec{v} = x\,\vec{i} + y\,\vec{j} + z\,\vec{k}$ be a vector based at the origin and pointing to a point in plane. Explain why

$$(\vec{v} - (\vec{j} + \vec{k})) \bullet \vec{N} = 0$$

gives us the equation for points in the plane. How do we know the solution space is two dimensional?

4) A plane in $\mathbb{R}^3$ can be described as a set of the form

$$\{(x, y, z) | a\,x + b\,y + c\,z = d\}$$

for constants a, b, c, d. Explain why the vector between any two points in the plane is orthogonal to $a\,\vec{i} + b\,\vec{j} + c\,\vec{k}$. What does this mean about $a\,\vec{i} + b\,\vec{j} + c\,\vec{k}$?

5) Please take a moment to provide comments upon the class so far. In particular, is the pace good? is the homework good? am I comprehensible? I'll be more than happy to receive any other comments you may have. Do this on a separate sheet of paper, to be turned in on Friday, *without* your name, etc.

(A little extra, for fun) Use vectors in $\mathbb{R}^2$, based at the origin, to describe the set of parallelograms whose two diagonals are perpendicular.