Due September 4, 2002

Read Chapter 1 (Should be second reading. This time read it for understanding)

The following problems (1 - 7) deal with the following set of Vectors:

$$\vec{A} = 3\,\hat{i} + 2\hat{j} + 1\,\hat{k} \qquad\qquad \vec{B} = 3\,\hat{i} - 5\hat{j} + 2\,\hat{k}$$

1. Determine $|\vec{A}|$, $|\vec{B}|$

2. Determine $\vec{A} \cdot \vec{B}$

3. Determine $\vec{A} \times \vec{B}$

4. Determine the angle between the two vectors

5. If $\vec{B}$ is a position vector (units - meters) and $\vec{A}$ is a force vector (units - Newtons), determine the moment (units - Newton meters) about the origin of the reference system.

6. Assuming the same vector designation as in prob. 5, determine the moment about the point (x,y,z) = (1,2,3).

7. Find two points, other than the origin, that the moment of force ($\vec{F} = \vec{A}$) equals zero.

8. The velocity at any point on a rotating body is given by $\vec{V} = \vec{\omega}_{body} \times \vec{r}$. Using the data from JGM-2, and assume a spherical earth, determine the magnitude of the velocity of someone
   a) at sea level on the equator
   b) in Blacksburg, altitude 2000 ft, and latitude of 37.229 degrees.

9. If $r(t) = 5\cos(3t)$ distance units, and $\theta(t) = 2t^2$ Radians, find the position, velocity, and acceleration vectors when t = 3 time units, that is find their radial and transverse components.

10. For the results in problem 9 find (at t = 3 time units)
   a) magnitude of $\vec{r}$

   b) magnitude of $\dot{\vec{r}}$

   c) $\dot{r}$

   d) magnitude of $\ddot{\vec{r}}$

   e) $\ddot{r}$