1. Let $\mathbf{u} =< 6, 3, 2 >$ and $\mathbf{v} =< 1, -2, -2 >$.

   (a) Find the angle between $\mathbf{u}$ and $\mathbf{v}$.

   (b) Express $\mathbf{u}$ as $\mathbf{u} = \mathbf{u1} + \mathbf{u2}$ where $\mathbf{u1}$ is **parallel** to $\mathbf{v}$ and $\mathbf{u2}$ is **orthogonal** to $\mathbf{v}$.

   (c) Sketch the 4 vectors mentioned i.e. $\mathbf{u}$,$\mathbf{v}$, $\mathbf{u1}$ and $\mathbf{u2}$.

   (d) Compute $\mathbf{u} \times \mathbf{v}$.

2. Find the following euations where the point $P = (-3, 0, 7)$ and the vector $\mathbf{N} =< 5, 2, -1 >$.

   (a) The plane which contains P and has $\mathbf{N}$ as its normal.

   (b) The line which contains P and is parallel to $\mathbf{N}$.

   (c) A line which contains P and is perpendicular to $\mathbf{N}$. Hint: hold up 2 perpendicular pencils.

3. For $r(t) =< t\sin(t) + \cos(t), \sin(t) - t\cos(t), 1 >$.

   (a) Sketch the curve in $R^2$and plot the points $t = 0, \pi/2, \pi, 2\pi$.

   (b) Find $r'(t)$.

   (c) Find $r''(t)$.

   (d) Find T, N.

   (e) Write $r"(t)$ in terms of T, N .

4. Find the distance of the point $P = (1, 1, 3)$

   (a) to the line **L:** $x = 1 + t,\ y = 3 - t,\ z = 2t$

   (b) to the plane **P:** $3x + 2y + 6z = 6$.

5. (a) Find the equation of a plane through the points $(0, 0, 0), (3, 2, 1), (1, 1, 1)$.

   (b) Sketch the plane in the first *octant*.

6. Sketch the following:

   (a) The surface $x^2 + y^2 + z^2 - 4x - 4y = 0$ (hint: complete the square). Partial credit will be given for the sketch in each of the planes.

   (b) The surface $x^2 + y^2 - 9 = 0$.

7. A shot put is launched at a velocity of 44 ft/sec with an elevation angle of $\pi/4$ and at a height of 6.5 *feet*.

   (a) Find the max height attained.

   (b) Find the range.

   (c) Find the speed with which it hits the ground.

Lab1 Assignment 2: Working in groups of at most two, you will redo the exam (it will be posted on the web) in Maple. The lab report will be due Thursday 2/22 at 2 p.m. , not after.