Math 242 - Homework 5   **Due Thursday, October 2**

Exercises from the Book

- Chapter 1.8# 3, 4, 6, 9, 10, 11, 13

Additional Exercises

1. Show that the equation $\rho = 6 \sin\phi \cos\theta$ in spherical coordinates describes a sphere centered at $(3, 0, 0)$ with radius 3. Hint: Try multiplying both sides of the equation by ρ before converting the equation to rectangular coordinates.

2. Find a vector valued function that represents the intersection of the cone $x^2 + y^2 = z^2$ with the plane $y + z = 2$. Hint: Use y as the parameter to write formulas for x and z.

3. Does the curve $(t, 2t^2, t + 3)$ ever intersect the plane $4x - 2y + 3z = 0$? If so where?

4. Find the unit normal and unit tanget vectors $\mathbf{N}(t)$ and $\mathbf{T}(t)$ for the curve $\mathbf{r}(t) = (t^2, 2t, \ln t)$. Hint: factor the formula for the speed $||\mathbf{r}'(t)||$ to get rid of the square-root.

The *unit tangent* vector to a curve $\mathbf{r}(t)$ is:

$$\mathbf{T}(t) = \frac{\mathbf{r}'(t)}{||\mathbf{r}'(t)||}$$

The *unit normal* vector is

$$\mathbf{N}(t) = \frac{\mathbf{T}'(t)}{||\mathbf{T}'(t)||}$$