Math 217 Assignment 1
Due Friday September 18

■ **Problems from the text (do NOT turn in these problems):**
- Section 13.1: 1–6, 8–10, 12, 14, 16–17, 20, 22, 27–28, 30, 32, 35–42.
- Section 13.2: 4–8, 12–17, 20–26, 30, 33–38, 42, 46, 49, 51.
- Section 13.3: 3–6, 10–11, 15, 18, 20, 22, 23–26, 32, 43, 45–46, 48, 50, 53–54, 56–57.
- Section 13.4: 4–6, 9–13, 20, 29–32, 38, 40–49.

■ **Problems to turn in:**

1. Find an equation of the largest sphere with center $(5, 4, 9)$ that is contained in the first octant.

2. The magnitude of a velocity vector is called *speed*. Suppose that a wind is blowing from the direction N45°W at a speed of 50 km/h. (This means that the direction from which the wind blows is 45° west of the northerly direction. A pilot is steering a plane in the direction N60°E at an airspeed (speed in still air) of 250 km/h. The *true course, or track* of the plane is the direction of the resultant of the velocity vectors of the plane and the wind. The *ground speed* is the magnitude of the resultant. Find the true course and the ground speed of the plane.

3. (a) Describe in words (using a diagram if possible) the region of $\mathbb{R}^3$ represented by the inequality $x^2 + y^2 + z^2 > 2z$.
   (b) Let $\mathbf{r}_1$ and $\mathbf{r}_2$ be fixed points in the plane $\mathbb{R}^2$. Describe the set of all points $\mathbf{r}$ such that $|\mathbf{r} - \mathbf{r}_1| + |\mathbf{r} - \mathbf{r}_2| = k$, where $k > |\mathbf{r}_1 - \mathbf{r}_2|$.
   (c) Let $\mathbf{a}$ and $\mathbf{b}$ be fixed points in $\mathbb{R}^3$. Completely specify the set of points $\mathbf{r}$ satisfying the vector equation $(\mathbf{r} - \mathbf{a}) \cdot (\mathbf{r} - \mathbf{b}) = 0$.

4. A boat sails south with the help of a wind blowing in the direction S36°E with magnitude 400 lb. Find the work done by the wind as the boat moves 120ft.

5. Find a nonzero vector orthogonal to the plane through the points $P(2, 1, 5)$, $Q(-1, 3, 4)$, $R(3, 0, 6)$ and find the area of the triangle PQR.