This assignment is due under your TA's office door by **4:00pm on Friday**, October 16th. Remember that you are encouraged to discuss the problems with your classmates, but all work turned in must be your own.

1. Work the following problems from the text:
   
   (a) Section 11.7: 8, 26, 33, 37
   
   (b) Section 11.8: 18, 27, 35

2. Consider a sphere of radius $R$ and center $C(x_c, y_c, z_c)$. Suppose one wants to locate the points on the sphere closest to and farthest from a point in space $P_0(x_0, y_0, z_0)$. Clearly, one could construct a line from $P_0$ through the center of the sphere, and then move a distance $R$ along the line in either direction from $C$. As a Calculus III student, you want to impress your friends and family by doing this calculation using Calculus III concepts, Lagrange Multipliers, in particular.

3. A classic problem from Calculus I is to take a wire of length $L$ and cut it into pieces. One piece is bent into a circle and the remainder is bent into a square.
   
   (a) Determine how the wire should be cut so the maximum area is enclosed by the two shapes. In particular, how much of the wire is used for the circle and how much is used for the square?
   
   (b) How much area is enclosed in the square?
   
   (c) How much area is enclosed in the circle?
   
   (d) What is the maximum enclosed area?

   Although this problem can be worked using Calculus I concepts, do it using Calculus III concepts.

4. Earlier in the semester you saw that the shortest distance between a point $P_1(x_1, y_1, z_1)$ and a plane $ax + by + cz = d$ was given by the formula

   \[ D = \frac{|ax_1 + by_1 + cz_1 - d|}{\sqrt{a^2 + b^2 + c^2}} \]

   Use Lagrange Multipliers to re-derive this formula. In addition, give the precise coordinates of the point on the plane closest to $P_1$. 