Math 217 Assignment 5
Due Friday October 23

■ **Problems from the text (do NOT turn in these problems):**

- Section 15.6: 30–35, 39–44, 47–60.
- Section 15.7: 5–18, 29–36, 39–54.
- Section 15.8: 3–17, 20, 21, 23, 40-42.

■ **Problems to turn in:**

1. Suppose you are climbing a hill whose slope is given by the equation
$$z = 1000 - 0.005x^2 - 0.01y^2$$
where x, y and z are measured in meters, and you are standing at a point with coordinates $(60, 40, 966)$. The positive x-axis points east and the positive y-axis points north.
   (a) If you walk due south, will you start to ascend or descend? At what rate?
   (b) If you walk northwest, will you start to ascend or descend? At what rate?
   (c) In which direction is the slope largest? What is the rate of ascent in that direction? At what angle above the horizontal does the path in that direction begin?
2. Find the equation of the tangent plane and normal line to the surface $yz = \ln(x + z)$ at $(0, 0, 1)$.
3. Find three positive numbers whose sum is 12 and the sum of whose squares is as small as possible.
4. Find an equation of the plane that passes through the point $(1, 2, 3)$ and cuts off the smallest volume in the first octant.
5. Find the absolute maximum and minimum values of $f(x, y) = e^{-x^2-y^2}(x^2 + 2y^2)$ on the disk $D = \{(x, y) : x^2 + y^2 \leq 4\}$.
6. Use Lagrange multipliers to find the maximum and minimum values of $f(x, y) = \frac{1}{x} + \frac{1}{y}$ subject to the given constraint $\frac{1}{x^2} + \frac{1}{y^2} = 1$.
7. The plane $x + y + 2z = 2$ intersects the paraboloid $z = x^2 + y^2$ in an ellipse. Find the points on this ellipse that are nearest to and farthest from the origin.