HW 5
Math 261, F18

Please see the course syllabus for details on how to turn in your homework assignments. This one is due at the beginning of your class on **Friday, October 5**.

1. Find the derivative of $h(x, y, z) = x + 2y^2 + 3z^3$ at the point $(2, 0, \sqrt{2})$ in the direction of the vector $\mathbf{v} = \langle 1, 1, 0 \rangle$.

2. Find the equation for the tangent plane to the surface $x^2 - xy - y^2 - z = 0$ at the point $(1, 1, -1)$. Please give your answer in the form $Ax + By + Cz = D$.

3. Give the best possible upper bound (using the technique from class, i.e. using a linear approximation) for the error in approximating $f(x, y) = x^2 + 3xy - 2y^2$ at the point $(1, 1)$, over the rectangle $|x - 1| \leq 0.1$, $|y - 1| \leq 0.3$. It is OK to leave your answer as a numerical expression (i.e., not simplified down to a number).

4. Let f be some function of the plane, such that $(1, 1)$ and $(1, -1)$ are critical points. Suppose $f_{xx} = x + 2$, $f_{xy} = x + y - 2$, and $f_{yy} = y + 1$. Classify (min/max/SP) the critical points $(1, 1)$ and $(1, -1)$, clearly indicating any computed values you used to make your decision.

Be sure to study up on Lagrange multipliers, too, since we won't be able to give you homework on that before the exam!