Homework Assignment for Week 10

1. Section 14.7: Problems 31, 35, 39, 61,
2. Section 14.7: Problems 44. Do this problem again using the gradient analysis (plotting ∇f near the critical point to determine whether the critical point is a local minimum, local maximum or neither).
3. Section 14.8: Problems 1, 23, 27, 33, 35.
4. Section 14.10: Problems 3, 7, 9, 12.
5. Continue on problem 12: Give a formula for $\left(\frac{\partial u}{\partial x}\right)_y$ where $u = u(x, y, z, w)$ and $f(x, y, z, w) = 0$, $g(x, y, z, w) = 0$.
6. Follow up on example 5 of section 14.8: Let $f(x, y, z) = x^2 + y^2 + z^2$ and compute $\frac{df}{dx}$ at $P_1 = (\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 1 - \sqrt{2})$, subject to the two constraints $g_1(x, y, z) = x^2 + y^2 - 1 = 0$ and $g_2(x, y, z) = x + y + z - 1 = 0$. That is, evaluate $\frac{d}{dx} f(x, y(x), z(x))$ at $x = \frac{\sqrt{2}}{2}$, where $y = y(x)$ and $z = z(x)$ are implicitly given by the constraints $g_1 = 0$ and $g_2 = 0$. Can you explain why you get $\frac{df}{dx} = 0$ there?