Homework 2, 18.994. Due Wed Sep 29th

All problems worth 4 points. All homework sets will be worth the same amount unless otherwise indicated.

1. Show that the system

$$3x + y - z + u^2 = 0 \quad (1)$$
$$x - y + 2z + u = 0 \quad (2)$$
$$2x + 2y - 3z + 2u = 0 \quad (3)$$

   can be solved for x, y, u in terms of z, for x, z, u in terms of y, for y, z, u in terms of x but not for x, y, z in terms of u.

2. Set $f(x, y, z) = x^2y + e^x + z$. By considering f at $(0, 1, -1)$, show that there exists a diff'ble ftn g on a nbhd of $(1, -1)$ in $\mathbb{R}^2$ such that $g(1, -1) = 0$ and $f(g(y, z), y, z) = 0$.

3. Prove Lagrange's identity

$$(\sum_{k=1}^{n} a_k b_k)^2 = \sum_{k=1}^{n} a_k^2 \sum_{k=1}^{n} b_k^2 - \sum_{1 \leq k < j \leq n} (a_k b_j - a_j b_k)^2.$$

do Carmo 2.5 1a,3,5.