MATH 8445, Fall '14

Homework 2

- 1. Read the notebook "A first program in FEniCS" linked from the course web page and make sure you understand it. Download the program firstprog.py, run it, and experiment with it.
- 2. Read the notebook "Boundary conditions" and modify firstprog.py to allow for an inhomogeneous Neumann boundary condition  $\partial u/\partial n = g$ . Also modify the program to use Lagrange elements of degree 3. For the cubic polynomial

$$u(x,y) = 3 - x + 2y^2 - 4x^2y + y^3,$$

compute the corresponding f and g, and then use your program to compute  $u_h$ , the finite element approximation. Since the exact solution is a cubic polynomial, your program should compute it exactly. Verify that that is indeed the case by printing out the value of  $u(1/\sqrt{2}, 1/3)$  computed from the formula above and from your computed  $u_h$ . Email me the program and the output.