MATH 8446, Spring '12

Homework 1

1. Design a  $C^1$  finite element for triangular meshes whose shape functions are polynomials of degree at most 6. Clearly state what are the degrees of freedom associated to each vertex, edge, and triangle of the mesh. Carefully draw an element diagram (like the one in Figure 6.4 of the notes). Verify that the number of degrees of freedom is equal to the dimension of the shape function space and prove that the DOFs are unisolvent. Verify that the element belongs to  $C^1$ .

2. Generalize the above problem to  $C^1$  finite elements using polynomials of degree at most r, for any  $r \ge 5$  (r = 5 being the Hermite quintic or Argyris element, and r = 6 being the element of the previous problem).