MATH 5520 – Finite Element Methods. April 19, 2011

Final Project 3

1. Write a code that uses C^1 Hermite element method to solve problem of the form,

$$\begin{aligned} -(a(x)u')' &= f(x), \quad x \in (0,1), \\ u(0) &= u_l, \\ u(1) &= u_r. \end{aligned}$$

   Test your code by showing h^3 and h^4 convergence rates in H^1 and L^2 norms, respectively, for the problem with following data

$$\begin{aligned} u(x) &= e^x \sin x, \\ a(x) &= 1 + x. \end{aligned}$$

2. Using your code, investigate numerically the behavior of the solution to the following problem

$$\begin{aligned} -(xu')' &= 1, \quad x \in (0,1), \\ u(0) = u(1) &= 0. \end{aligned}$$