

Physics 7412, Fall 2013

Problem set 5 (Last!)

Due date: 11/13/13

Use the finite element method to solve problem 12.4.1 of Burden and Faires, that is the PDE defined on the triangle $(0, 0.5), (0.5, 0.5), (0, 1)$,

$$\frac{\partial}{\partial x} \left(y^2 \frac{\partial}{\partial x} u(x, y) \right) + \frac{\partial}{\partial y} \left(y^2 \frac{\partial}{\partial y} u(x, y) \right) - yu(x, y) = -x \quad (1)$$

with boundary conditions $u(x, 0.5) = 2x$ for $0 \leq x \leq 0.5$ and $u(0, y) = 0$ for $0.5 \leq y \leq 1$ and

$$y^2 \frac{\partial}{\partial x} u(x, y) \cos \theta_1 + y^2 \frac{\partial}{\partial y} u(x, y) \cos \theta_2 = \frac{\sqrt{2}}{2}(y - x) \quad (2)$$

along the line connecting $(0.5, 0.5)$ to $(0, 1)$.

Use two triangular elements only: T1 with vertices $(0, 0.5), (0.25, 0.75), (0, 1)$ and T2 with vertices $(0, 0.5), (0.5, 0.5), (0.25, 0.75)$.