King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 572 , Term: 081
Instructor: Dr. Faisal Fairag
Assignment (3)
Due Sunday 2/11/2008

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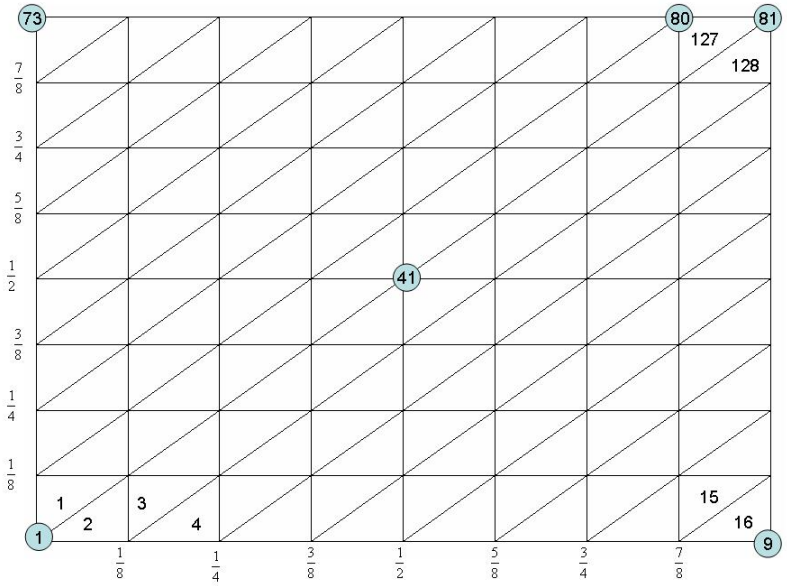
1) Consider the triangulation τ_h



Label the triangles and the nodes from left-bottom to right-top then find the matrix t, e, and p.

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(2) Evaluate the integral by mapping the triangle K back to the reference triangle.

$$\iint_K (\varphi_{1,x}\varphi_{2,x} + \varphi_{1,y}\varphi_{2,y})dxdy$$

Where K is the triangle with vertices $N_1 = (3,3), N_2 = (6,5), N_3 = (4,8)$ where φ_1, φ_2 are the local basis functions associated with the node N_1, N_2 respectively.

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(3) Consider the following BVP:

$$-\Delta u + 2u = f \text{ in } \Omega = (0,1)\times(0,1)$$
$$u = 0 \quad \text{on} \quad \Gamma$$

a) solve the BVP by the finite element method based on piecewise linear approximating functions on the triangulation τ_h on problem (1).

b) use PDETOOLBOX in Matlab to solve the BVP and compare your result in (a) at the point (0.5,0.5)
