ES128: Homework 4
Due in class on Wednesday, 7 April 2010

Problem 1

Consider a one-element triangular mesh shown in Fig. 1. The boundary conditions are as follows. The edge BC is constrained in y and traction free in x, whereas the edge AB is constrained in x and traction free in y. The edge AC is subject to traction normal to the edge as shown in Fig. 1. Assume Young's modulus $E = 3 \times 10^{11}$ Pa and Poisson's ratio $\upsilon = 0.3$.

a. Construct the stiffness matrix.
b. Calculate the global force matrix.
c. Solve for the unknown displacement matrix and calculate the stress at (1.5, 1.5).

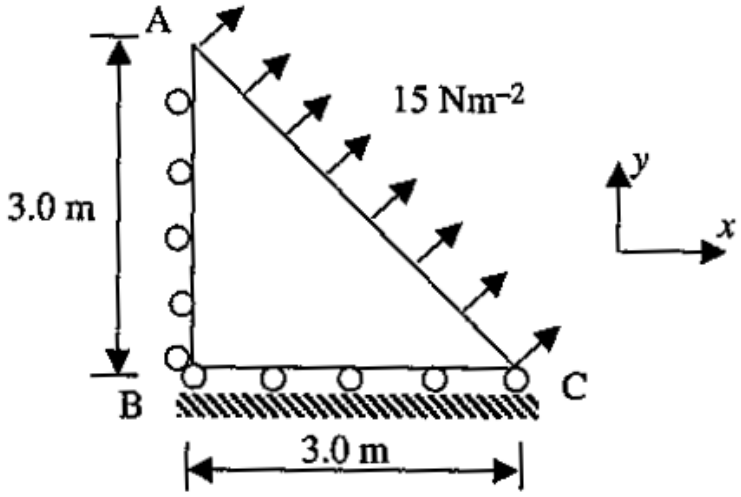

Fig. 1 Triangular domain with mixed boundary conditions

Problem 2

For the two-dimensional loaded plate shown in Fig. 2, determine the displacement of nodes 1 and 2 and the element stresses using plane stress conditions. Body force may be neglected in comparison with the external forces.

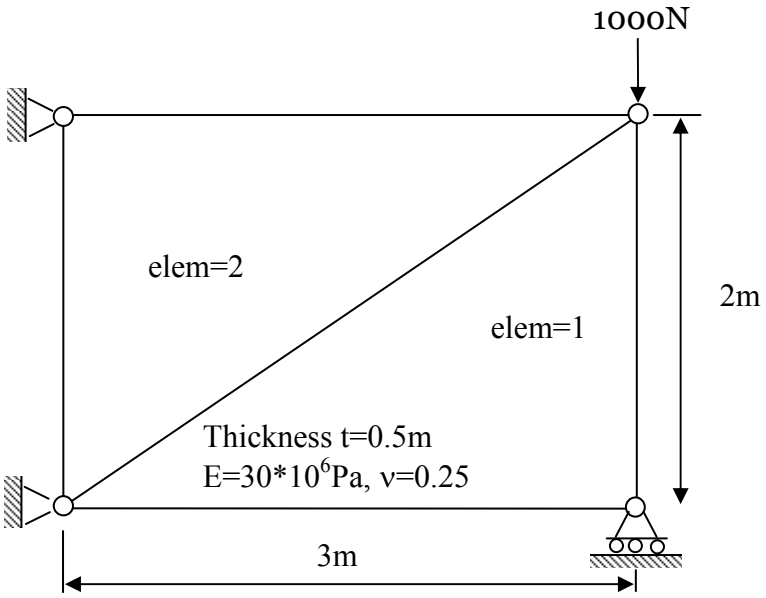

Fig. 2