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2.094 Finite Element Analysis of Solids and Fluids  
Spring 2008

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**2.094**  
**FINITE ELEMENT ANALYSIS OF SOLIDS AND FLUIDS**  
**SPRING 2008**

**Homework 3**

Instructor: Prof. K. J. Bathe

Assigned: 02/21/2008  
Due: 02/28/2008

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**Problem 1 (10 points):**

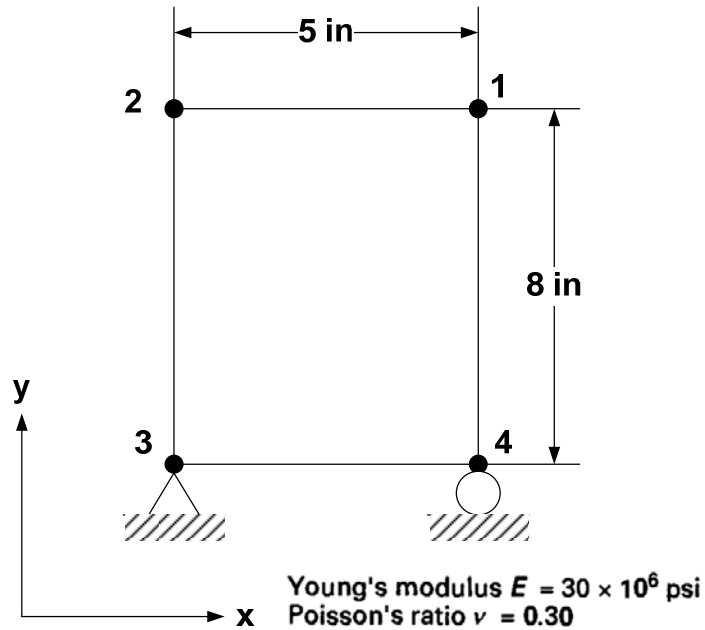
The four-node plane strain element shown is subjected to the constant stresses

$$\tau_{xx} = 20 \text{ psi}$$

$$\tau_{yy} = 10 \text{ psi}$$

$$\tau_{xy} = 10 \text{ psi}$$

Calculate the nodal point displacements of the element.



**Problem 2 (20 points):**

Consider the element 4 in Fig. E4.9 in the textbook (p.180-181).

(a) Show explicitly that

$$\mathbf{F}^{(4)} = \int_{V^{(4)}} \mathbf{B}^{(4)T} \boldsymbol{\tau}^{(4)} dV^{(4)}$$

(b) Show that the element nodal point forces  $\mathbf{F}^{(4)}$  are in equilibrium.

**Problem 3 (10 points):**

Exercise 4.15, p. 221-222 in the textbook.