

# 2.094

## FINITE ELEMENT ANALYSIS OF SOLIDS AND FLUIDS

### SPRING 2008

### Quiz #2

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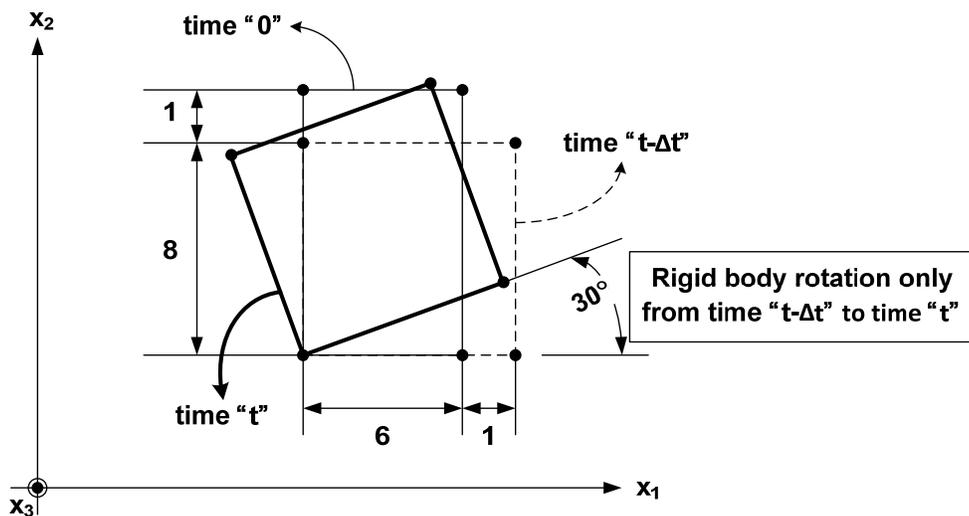
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#### Problem 1 (10 points)

A computer program is used to perform a plane strain analysis. A total Lagrangian formulation is employed with the given elastic material law. Consider the 4-node element shown at time “t”. For this time:

- a) Calculate the deformation gradient.
- b) Calculate the second Piola-Kirchhoff stresses.
- c) Give the equation to calculate the Cauchy stresses. Do not actually do the arithmetic.

$${}^t_0 \underline{S} = E \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1/2 \end{bmatrix} {}^t_0 \underline{\varepsilon}; \quad \text{Poisson's ratio} = 0$$





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