AE 625 SPRING 2025
HOMEWORK #7
Due Thursday, May 8, 2025

Note: If any computer programs are used to obtain the solutions, the programs used must be uploaded via BlackBoard. The upload link is provided within the folder of "Homework #7." Please combine all programs into one single pdf file. Homework assignments are due at the beginning of the class on the due date. A hard copy of handwritten work must be submitted in class.

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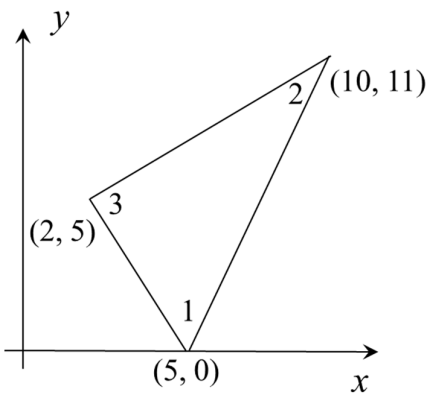
1. Determine the stiffness matrix of the three-noded 2D plane strain triangular element shown below. The coordinates are shown in inches. E = 10 Msi, v = 0.33, and the thickness is 1 inch. (15 points)

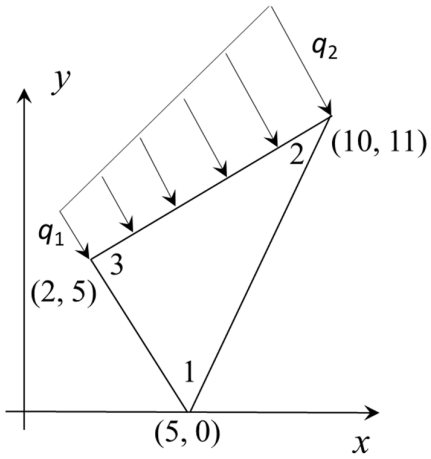


2. For the plane strain element given in Problem 1, the nodal displacements are given as

u_1 = 0.001 in., v_1 = 0.002 in., u_2 = - 0.001 in.,
v_2 = -0.001 in., u_3 = - 0.003 in., v_3 = 0.000 in.,

Determine the element stresses σ_x, σ_y, σ_z, τ_{xy}. E = 10 Msi, v = 0.33. (10 points)

3. Determine the equivalent nodal forces (x- and y-components) for a linearly distributed pressure load on the edge of the triangular plane strain element as shown below where q_1 = 100 psi and q_2 = 200 psi. The coordinates are shown in inches and the thickness is 1 inch. (10 points)



4. Determine the nodal displacements and the element stresses for the thin plate (plane stress condition) with a uniform traction $T_y = 2{,}000$ psi. The thickness of the plate is 0.2 in., $E = 10$ Msi, $\nu = 0.33$, $L_1 = 6$ in., $L_2 = 12$ in. (20 points)