ME 260: Structural Optimization: Size, Shape, and Topology		
Assigned: Sep. 1, 2022	Homework 2	Due: Sep. 8, 2022

Problem 1 (10 points)

This is a preparatory exercise for writing 3D truss topology optimization code in the first programming assignment. Define your own 3D truss after becoming familiar with the 3D Truss code (attached in the email and downloadable from the course website >> Course work page) and analyze its deformation. Use realistic dimensions and loads so that you can relate to the numbers.

- (a) Verify the unit virtual load method in computing the displacement.
- (b) Verify Maxwell's reciprocity theorem by choosing any vertices in your truss.

Include all details and plots with complete explanations.

Problem 2 (20 points)

- (a) Consider minimizing the strain energy for given volume of the three-bar truss given below. Derive the expression for the Lagrangian solely in terms of the Lagrange multiplier corresponding to the volume constraint. Maximize the Lagrangian w.r.t. to the multiplier to find the optimum truss.
- (b) Now, do the same for minimizing the volume of the truss when there is a constraint is on the displacement of the moving support in the *x* direction to be 3 mm. Find the optimum truss for this, again using the dual method.

