Homework 6

Due: Dec. 1 2025

1. Exercise 2 on page 71.

2. Exercise 1 on page 75.

3. Install Gmsh (https://gmsh.info/) in your computer. It is an open-source mesh generation tool. Use Gmsh to open the file square.geo at https://github.com/ju-liu/MAE-310-2025F/blob/main/gmsh-files/square.geo

A .geo file is a geometry and mesh definition script used by Gmsh. It describes the geometry of your domain, the mesh setting, and physical group definitions. Our square.geo file is commented. Go over it. Make sure you understand the grammar and structure of a typical .geo file.

a) You may load the file into Gmsh, generate the mesh, and export the mesh into a .m file that can be loaded into Matlab. Please provide the .m file and comment the mesh file in a manner analogous to the comment I made for the .geo file. Explain the meaning of the major section. Provide your commented .m file. What are the IEN arrays for the 2D mesh and the h-boundary? What is the ID array?

b) Try Mesh.ElementOrder = 2 and regenerate the mesh in .m file. What are the differences in the generated files? (hint: nodal points, element connectivity arrays, etc.)

c) The current .geo file only supports meshing the domain using triangle element. Learn online on how to modify the script to produce **quadrilateral** elements. Provide the modified .geo file. Comment on how you modified the script and what differences you observe in the mesh compared with the triangular version.