ESM 5734
Homework 7
Due date: 31 October 2022 at 11:15 AM

For the following boundary-value problem

$$EI\left(w'''' - \gamma^2 w^{v1}\right) + f = 0, \quad 0 < x < l,$$

$$w(0) = 0, \quad \left(\gamma^2 w^{v} - w'''\right) = 0 \text{ at x} = l,$$

$$w''(0) - \gamma^2 w^{1v}(0) = 0, \quad w'(l) = 0, w''(0) = 0, \quad w'''(l) = 0,$$

where E = 2 GPa, I = 500 cm^4, (gama) = 25 cm, f = 12 kN/m

(a) classify boundary conditions into essential and natural,

(b) develop a weak formulation of the problem,

(c) develop a matrix formulation of the problem,

(d) find expressions for shape functions,

(e) for a finite element mesh of 4 elements, plot basis functions for node 3,

(f) evaluate the stiffness matrix for element 1, and

(g) evaluate the load vector for node 3.