

NEEP 602 -- Engineering Problem Solving II
Homework 5
Due Thursday 4/7

11. Eigenvalue Problem (15 points)

Use Matlab to find the first three natural frequencies and mode shapes for a uniform beam which is guided at one end and pinned at the other. The equation of motion is

$$EI \frac{d^4 y}{dx^4} - m\omega^2 y = 0$$

where EI is the flexural rigidity, m is the mass per unit length, and ω is the natural frequency, x is the distance from the end, and y is the displacement of the beam.

The boundary conditions for such a beam are

$$y'''(0) = 0 = y'(0), \quad y(L) = 0 = y''(L)$$

Use $EI = 80,000 \text{ N-m}^2$, $m = 1.5 \text{ kg/m}$, $L = 5.0 \text{ m}$