CEE 6513 Computational Methods in Mechanics
Fall 2023 Georgia Tech
Homework 4. Due: Oct 25 (Canvas)

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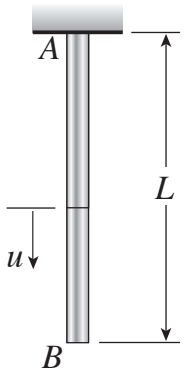
1 Problem (20 points)



Consider the differential equation for the displacement u of a bar of length L hanging under its own weight (figure):

$$-\frac{d^2u}{dx^2} = 1\,. \tag{1}$$

The boundary conditions are:

$$u(0) = 0, \quad u'(L) = 0\,. \tag{2}$$

Solve the above differential equation using the second-order finite-difference method. Compare your numerical results with the theoretical result for different mesh-sizes, and in doing so, show the convergence of the numerical results with mesh-size. Also determine the corresponding convergence rate.