UNIVERSITY OF CALIFORNIA BERKELEY
Department of Civil Engineering
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Structural Engineering,
Mechanics and Materials
Professor: S. Govindjee

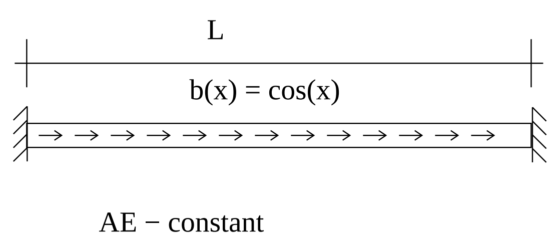
HW 1: Due Thursday Jan. 27

Problems 2-5 **must** be solved by an ODE method; i.e. first write down the governing ODE and its boundary conditions, second solve.

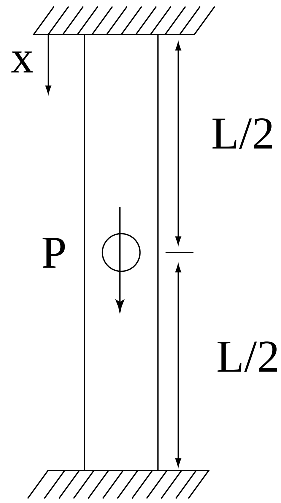
1. Using the governing equation for the axial deformation of a bar, argue why the displacement field must be quadratic (independent of the boundary conditions for the bar) in the presence of a constant distributed body force; i.e. for the case where $b(x) = b_o$ a constant. Assume AE is constant.

2. Consider a bar of length L with constant EA and constant density ρ. The bar is supported by a fixed pivot and spun about it at angular frequency ω. Doing so produces a distributed body force of $b(x) = A\rho\omega^2 x$, where x is measured from the pivot. Find an expression for the maximum displacement and its location.

3. For the bar shown determine the displacement field $u(x)$.



4. You are given a prismatic bar with constant cross-sectional area A, Young's Modulus E, and length L. Determine the reaction force at the top of the bar due to the load P.



5. The bar shown is built-in at the left and supported by a spring with spring constant k at the right. List the boundary conditions at $x = 0$ and $x = L$. Find the expression for $u(x)$.