**HW 1: Due Wednesday Feb. 3**

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

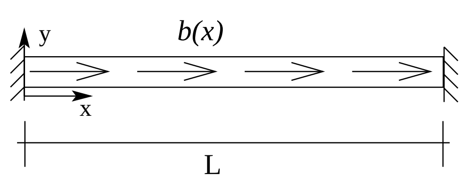
1. Using the governing equation for the axial deformation of a bar, argue why the displacement field must be linear (independent of the boundary conditions for the bar) in the absence of any distributed body forces; i.e. for the case where $b(x) = 0$. Assume $AE$ is constant.

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

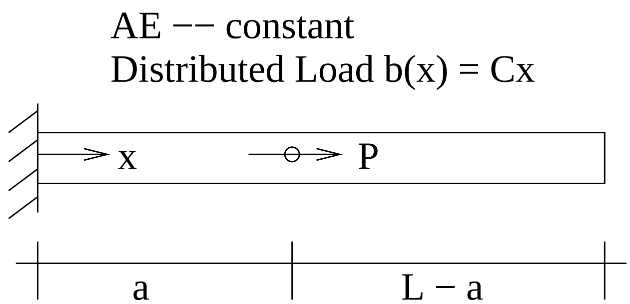

3. Consider an elastic bar with constant Young's modulus, $E$, and constant cross sectional area, $A$. The bar is built-in at both ends and subject to a spatially varying distributed axial load

$$b(x) = b_o \sin(\frac{2\pi}{L}x)\,,$$

where $b_o$ is a constant with dimensions of force per unit length. Determine the largest (in magnitude) **compressive** internal force.



4. For the linear elastic bar shown. Determine the axial displacement as a function of $x$. Note that there is a distributed load and a point load. The point load should be modeled using a delta function.




5. Find the axial deflection in the bar, $u(x)$. Assume constant $AE$ and length $L$.