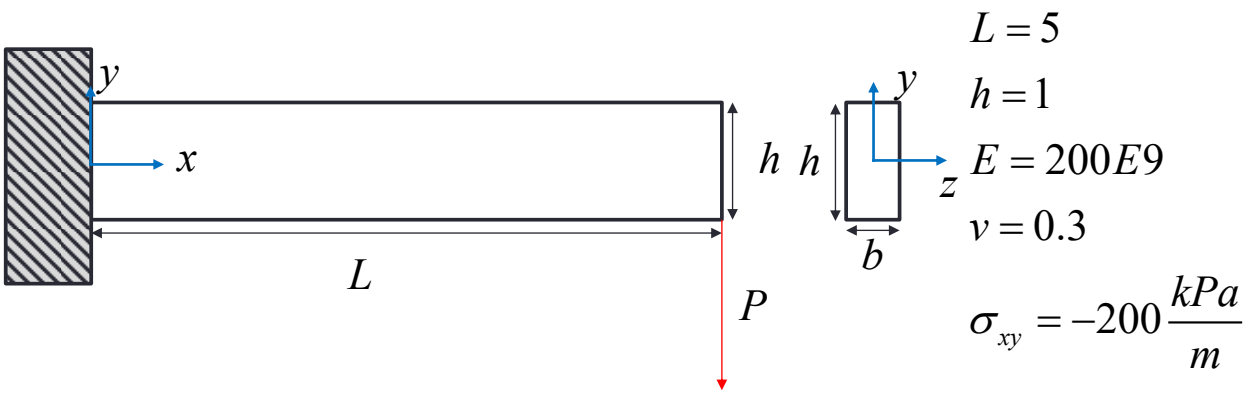
HOMEWORK 7

ASSIGNED: 11/06/25

DUE: 11/13/25 on ELC (MATLAB script and PDF with results, sketch of selected nodal/element numbering and work done by hand), before class



Solve for the deflection at the end of the beam of length L=5m, width b (unspecified), and height h=1m. Assume plane stress, E=200GPa, and v=0.3. The left-hand side of the beam is fixed (no displacement allowed in x or y). A uniform stress σ_{xy} is applied on the right-hand face (ignoring constraints on equilibrium), such that the total tip load P may be expressed as a function of the geometry and σ_{xy} like so:

$$P = \int_{-0.5b}^{0.5b} \int_{-0.5h}^{0.5h} \sigma_{xy} dy dz = \sigma_{xy}(b)(h)$$

Note that this stress will be directed in the y direction – this will not be normal to the surface. You should provide this as an input using:

$$[\tau] = \begin{bmatrix} 0 \\ -200E3 \end{bmatrix}$$

Discretize the geometry as a single four-node element. Calculate the deflection of each node in the beam in both x and y with the assigned boundary conditions and material properties, assuming plane stress.