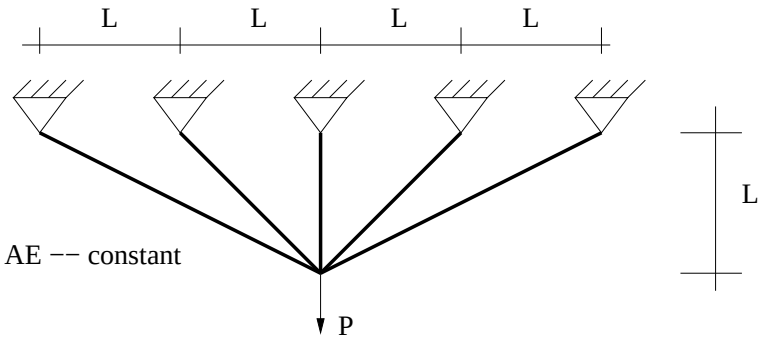
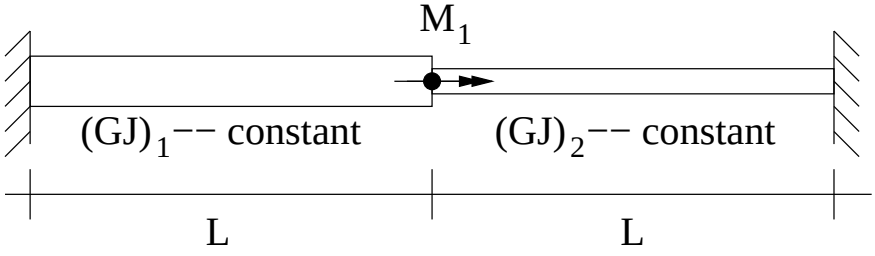
HW 5: Due Wednesday March 17

1. Use the concept of conservation of energy to determine the relation between the applied force and the vertical deflection at the load point.



2. For the stepped torsion bar below determine the rotation at the point of application of the load. Use the concept of conservation of energy.



3. Rework problem 1 using the concept of stationary potential energy. You should get the same answer.

4. Rework problem 2 using the concept of stationary potential energy. You should get the same answer.

5. Consider a cantilever beam with a uniform distributed load $q(x) = q_o$. Assume a deflection solution of the form $v(x) = Cx^2$ and determine an *approximate* solution by minimizing the potential energy. Compare the tip deflection to the exact solution.

6. Consider a round elastic bar of length L with constant shear modulus, G, and polar moment of inertia, J. The bar is built-in at both ends and subject to a spatially varying distributed torsional load

$$t(z) = p \sin(\frac{2\pi}{L} z) \,,$$

where p is a constant with units of torque per unit length. Find an *approximate* expression for the the rotation field using the principle of stationary potential energy. Compare your result to the exact solution.