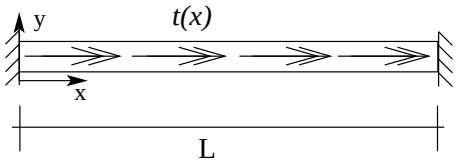
HW 1: Due Thursday Feb. 3

1. Consider a solid round elastic bar with constant shear modulus, $G = 140$ kN/mm^2, and cross sectional area, $A = 40$ mm^2. The bar is built-in at both ends and subject to a spatially varying distributed torsional load

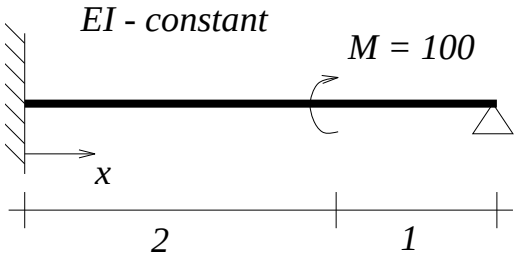
$$t(x) = p \sin(\frac{2\pi}{L} x)\,,$$

where $p = 50$ N $\cdot$ mm/mm and $L = 1000$ mm. Modify your program from Lab 1 to solve for the system response and determine the location and magnitude of the maximum internal torque in the bar.



2. Consider a circular bar which is built-in at both ends and loaded by a linear distributed load, $t(z) = t_o\, z$. By solving the governing second order ordinary differential equation find a relation that gives the amount of load needed to induce a rotation $\hat{\theta}$ at the mid-point of the bar. Assume GJ is a constant.

3. The beam shown below is loaded by a point moment at $x = 2$; find the maximum internal moment (in absolute value – i.e. independent of sign) by first solving the governing 4th order differential equation. [Hint: to find the maximum value just plot your answer.]



4. Find the equation for the deflection of the beam shown. Assume a constant value for EI. Use the given coordinate system.