

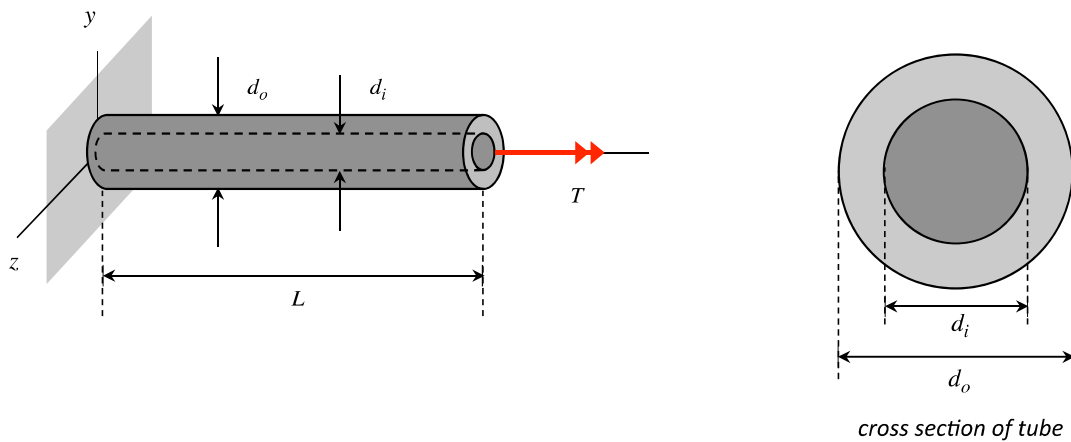
### Homework H33.A

**Given:** A tubular cross-section shaft has inner and outer diameters of  $d_i$  and  $d_o$ , respectively. The shaft is fixed to a rigid wall at its left end, and an axial torque  $T$  is applied to the right end. The material making up the shaft has a shear modulus of  $G$ .

**Find:** For this problem:

- Determine the maximum shear stress in the shaft. Where on the shaft's cross section does this maximum shear stress exist?
- Make a sketch of the shear stress on the cross section of the tube.
- Determine the maximum shear strain in the shaft. Where on the shaft's cross section does this maximum shear strain exist?

For this problem, use the following parameters:  $d_i = 2$  in,  $d_o = 4$  in,  $T = 30$  kip-ft and  $G = 11 \times 10^3$  ksi.



**Homework H33.B**

**Given:** A circular cross-sectioned shaft is made up of components (1) and (2). Component (1) has a tubular cross section, with inner and outer diameters of  $d$  and  $2d$ , respectively. Component (2) has a solid cross section with a diameter of  $d$ . Components (1) and (2) are joined by a rigid connector at B with (1) being attached to a fixed wall at end A. Rigid connector C is attached to end C of component (2). Torques  $3T$  and  $T$  act on connectors B and C, respectively, as shown.

- Find:** For this problem:
- Determine the torque load on each of the components as a result of the applied torques.
  - What is the maximum shear stress in the shaft? At what location(s) does this maximum stress exist?

Leave your answers in terms of  $T$  and  $d$ .

