University of Massachusetts, Amherst  
Department of Civil & Environmental Engineering  
CEE/MIE 630: Advanced Solid Mechanics

Homework #5: Due October 22

GRADED:

Problem 1: Consider the solid bar, hollow tube, and angle shown below: (a) Assuming \( r_0 = 1\text{in} \) and \( t = 0.25\text{in} \) calculate \( r_1 \), \( r_2 \), and \( a \) such that all three shapes have the same cross sectional area.

(b) Compute the total angle of twist for a bar of length \( L \) loaded with a torque \( T \) for each cross section. Assume \( G \) is the same for each member. Comment on results.

![Diagram of solid bar, hollow tube, and angle](image)

UNGRADED:

Problem 2:

The torque \( T \) produces a rotation of 15° at free end of the steel bar shown in Fig. P6.14. Use \( a = 24 \text{ mm} \), \( b = 16 \text{ mm} \), \( L = 400 \text{ m} \), and \( G = 80 \text{ GPa} \). What is the maximum shearing stress in the bar?