CIVL 1112 – Assignment #4

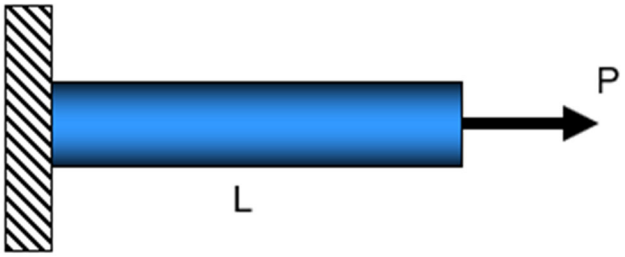
Name: _____

Objective

The purpose of this assignment is twofold: first, to understand and compute normal stress and strain values in a uniaxially loaded material, and second, to begin to consider these quantities in your work for Project #2.

You ***must*** hand in the coversheet for the assignment and your calculation on engineering paper for Part 1.

Part 1: Consider the linear-elastic prismatic bar fixed on the left-hand side and loaded by axial forces P at the right-hand side, as shown in the figure below (assume all measurements are "exact"). In all cases, report answers to three significant figures.



1. If the allowable stress at failure for the material is 25,000 psi and the applied load on the bar is **P** = 15,000 lb., what is the minimum area required to prevent failure?
2. If the bar fails at strains greater than 0.050 and the original length of the bar is **L** = 24 in., what is the maximum allowable deformation before failure?
3. If the material in the bar is considered linear-elastic and the tensile stress is 25,000 psi and the tensile strain is 0.020, what is the modulus of elasticity of the material?
4. If the original length of the bar is **L** = 10 ft. and it deforms 0.15 in., what is the stress in the material if the modulus of elasticity is 29,000 ksi?
5. Determine the cross-sectional area of a steel cable required to support a 15,000 lb. tensile force over 100 ft. while not exceeding the allowable tensile stress of 45,000 psi or a maximum elongation of 0.10 ft. Assume the modulus of elasticity of steel is E = 29,000,000 psi.

Part 2. Read Chapter 2 in the *Strategies for Creative Problem Solving* by Fogler and LeBlanc.