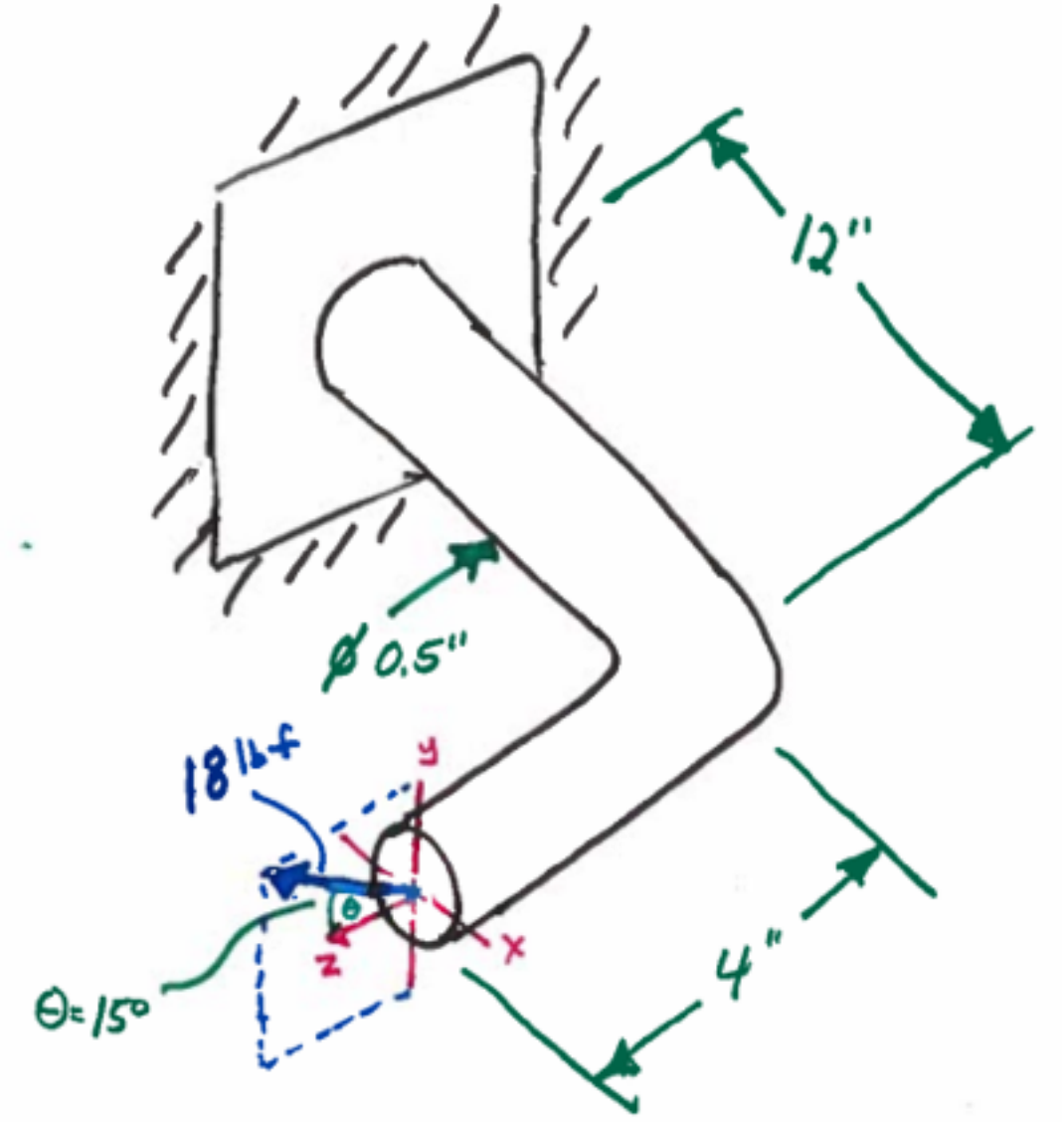
EME 150A Fall 2015 Homework #05

Date: Monday, November 02, 2015

DUE: Monday, November 09, 2015 before class in Box D in the MAE department.

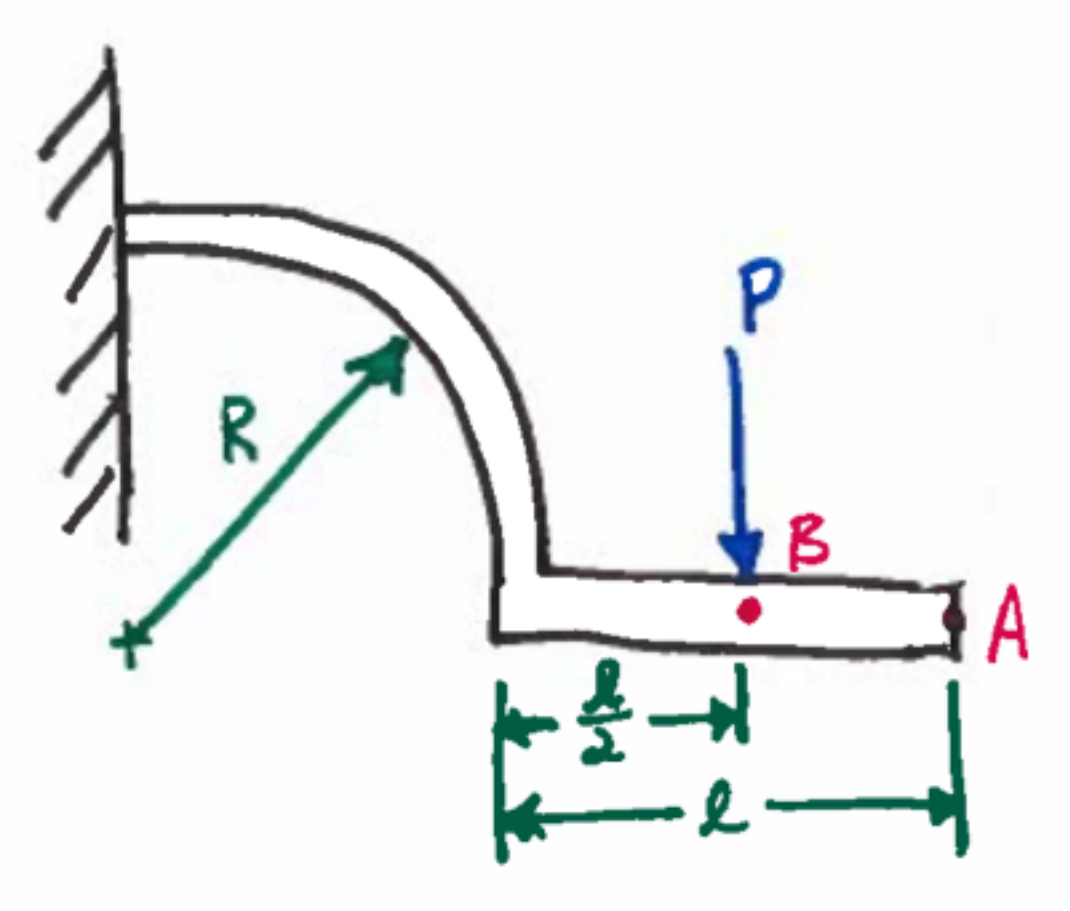
Problem 1

Find the deflection of the end of the bar in the direction of the applied force using Castigliano's theorem. The bar is made from steel.



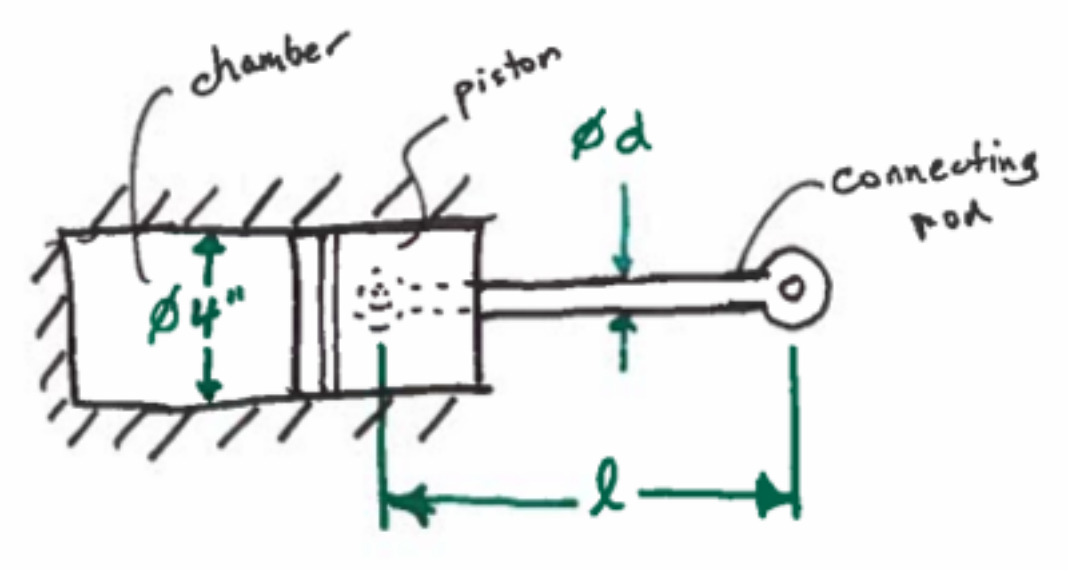
Problem 2

Shown below is a 3/16" diameter steel wire where R=5" and l=3". The applied force, P, is 1 lb. Estimate the vertical deflection of point A and justify any components of strain energy that you neglect.



Problem 3

A piston and connecting rod are shown below. If the operating pressure in the chamber is 2000 psi, the rod ends are pin joints, and the rod is made of AISI 1030 steel what should the preferred diameter of the rod be for a design factor of 3 to prevent buckling.



Problem 4

Determine an expression for what the outside diameter of a slender tube must be for buckling to occur if the inside diameter is d, the outside diameter is D, and the ratio of the two is K=d/D. The expression should be in terms of K, the critical load, column length, modulus of elasticity, and the end condition constant.