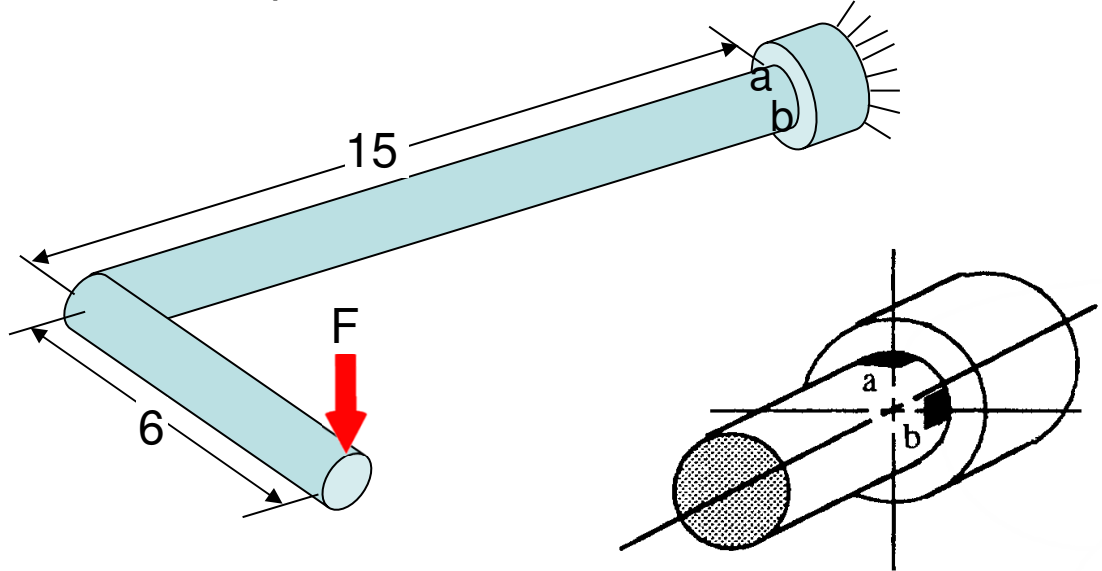


## MEEG3311 Homework 3 – Chapter 5

3.1

A  $\frac{3}{4}$ -inch diameter round bar is bent into the shape shown here and fixed to a wall. It is loaded at the tip with a force,  $F$ , of 100 lbs.

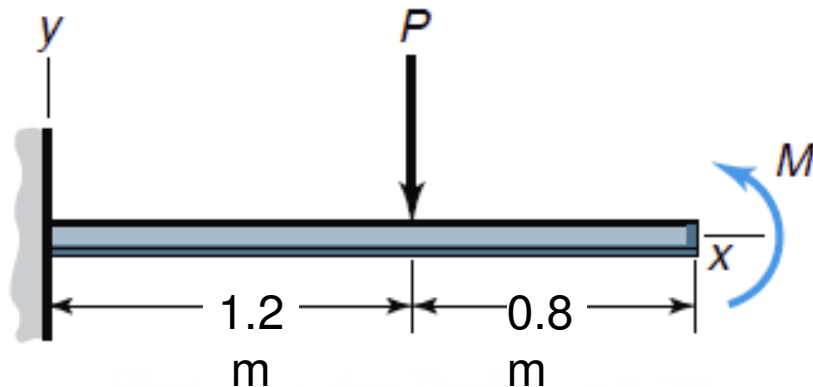


- Show your Free Body Diagram with the reactions at the wall.
- Compute and show the tensile and shear stresses at points "a" and "b".
- Combine the stresses at each location and give the maximum principal stress at each.

You don't have to draw a Mohr circle, but it would be a good idea.

- If the bar is aluminum ( $E = 10.1\text{Msi}$ , Poisson = 0.33) what is the vertical deflection at the end where  $F$  is applied? Hint: There are 3 components.

3.2



The cantilevered beam shown above has both a concentrated force,  $F = 4000\text{N}$ , and an end moment,  $M = 2500\text{ Nm}$ , acting on it.

The beam has a rectangular cross section with a height of 100mm and a width of 40mm. It is made of steel, with a modulus,  $E = 207\text{ GPa}$ .

- Using superposition, find the total deflection 1) at the tip and 2) where  $P$  is applied.
- Calculate how large the moment,  $M$ , would need to be to have zero deflection where  $P$  is applied.

Hint: Use the Beam Deflection Tables in Hamrock Appendix D and superposition.

Hint 2: Deflection is directly proportional to the load.