1) Find the tension, shear, and bending moment at D. Neglect gravity

   a) using section AD
   b) using section DBC
   c) Do the answers above agree?
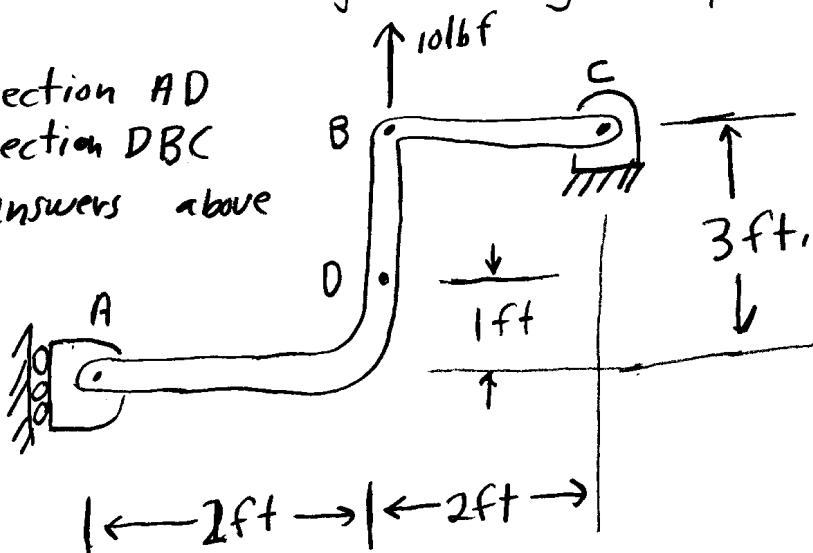

Note: you must show your sign convention for shear and (especially) bending moment (you decide, and show, which way is "smiling").

2) A vertical telephone pole is a uniform cylinder of wood with a diameter of 9" and a height of 30 ft. The density of the wood is 60 lbm per cubic foot. Find the tension, shear force and bending moment as a function of y (the distance up from the ground).

(ans: $M(y)=0$, $V(y)=0$, $T=-\rho g A(h-y)$)

3) Assume you want to hang a 10 lbf weight by a steel wire 1 mile long. What is the lightest wire that will do the job? Challenge.

Assume: density $\rho = 500 \ lbm/ft^3$

strong steel ⟨ max allowable tension stress, $= \sigma^* = 100,000 \ lbf/in^2$

[Tension/cross section area]

$A(y) =$ cross section area at pt y

I mile

y

10 lbf
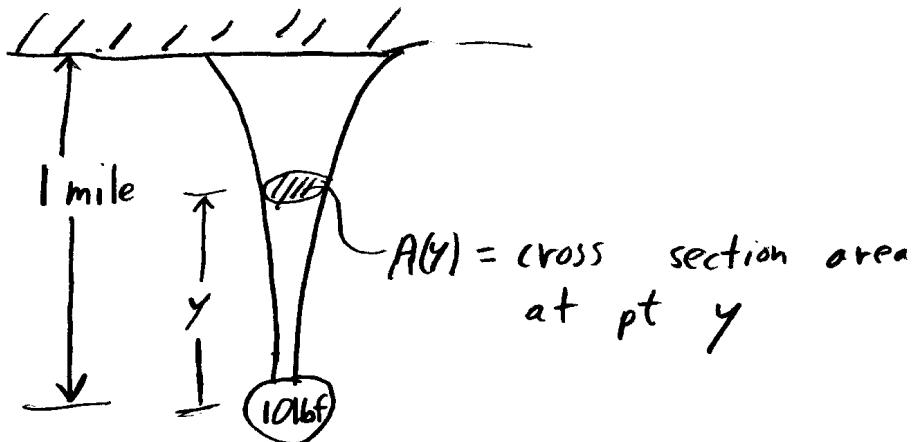
Hint: need to find $A(y)$ so that $\sigma(y) = \sigma^*$ for all y. Then find total volume of wire. Computer work is allowed if needed.

4) Draw shear and bending moment diagrams for these beams.

a)

100 lbf

neglect gravity

|← 10 ft. →|← 5 ft. →|
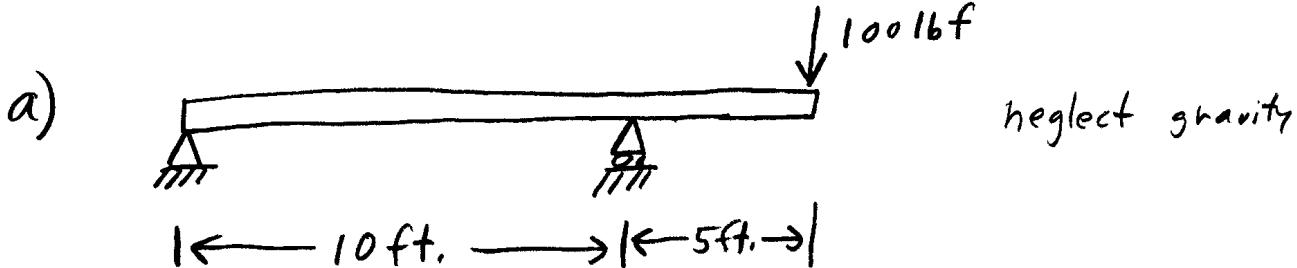
4b)
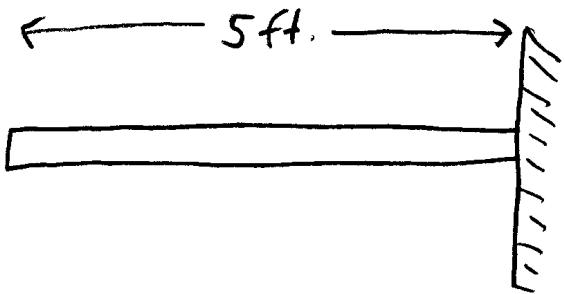
include gravity

cantilever beam loaded by its own weight.

1 in square cross section steel $(\rho = 500\ lbm/ft^2)$