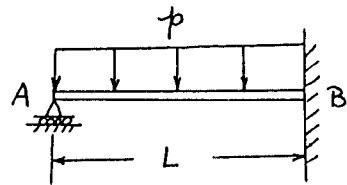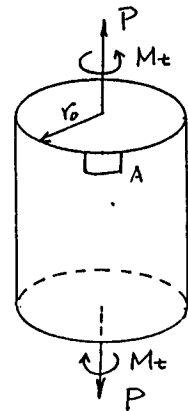1 For the beam shown, find the Reactions
   at A and B by using the Castigliano's
   (Energy) theorem.
   (p : uniformly distributed load)
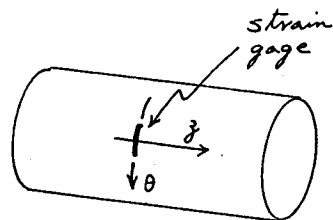

2. A circular shaft with radius r_0 is subjected
   simultaneously to an axial tensile force P
   and twisting moment M_t (as shown)
   (a) Draw the mohr's circle diagram of
       an element A $r = r_0$. (i.e. outside surface)
   (b) Compute the principal direction and
       principal stresses of the element A.

3. A long, thin-walled cylindrical tank
   has a radius r and a wall thickness t.
   Its ends are closed, and when a pressure
   p is put in the tank a strain gage
   mounted on the outside surface in a
   direction normal to the axial axis (i.e. z axis)
   of the tank measures a strain of ϵ_0.
   What is the pressure in the tank?

4 (a) Suggest (at least) three failure criteria for solids used
     in mechanical design.
   (b) Explain and write comments on these criteria.
       (failure criteria : criteria for solids to yield or fracture)

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