1. A double-web girder is constructed from two plywood sheets that are secured to wood members at its top and bottom. Assume A is pinned and B is roller.

   (a) If each fastener can support 600 lb in single shear, determine the required spacing s of the fasteners needed to support the loading $P = 3000$ lb.　　(8%)

   (b) Continue the previous problem. If the allowable bending stress for the wood is $\sigma_{allow} = 8\,\text{ksi}$, the allowable shear stress is $\tau_{allow} = 3\,\text{ksi}$, and the fasteners are spaced $s = 6$ in., check these three criteria and determine the maximum load P that can be applied to the beam.　　(12%)
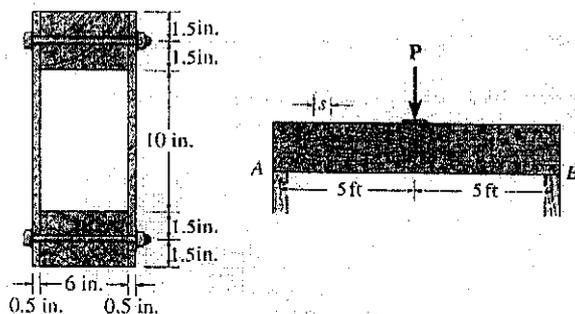
2. The beam is subjected to the couple moment at its end C as shown in the figure. Please use **Moment-Area Method** ONLY!! Note that EI is constant.

   (a) Determine the reaction at B.　　(10%)

   (b) Determine the slopes at A, B and C points.　　(10%)

3. The A-36 steel axle with modulus of rigidity G=75 G Pa, which is made from tubes AB and CD and a solid section BC. It is supported on smooth bearings that allow it to rotate freely. The tubes have an outer diameter of 40 mm and an inner diameter of 20 mm. The solid section has a diameter of 60 mm. If the gears, fixed to its ends, are subjected to 100- N・m torques as shown in following figure, determine the angle of twist of gear A relative to gear D.　　　(20%)
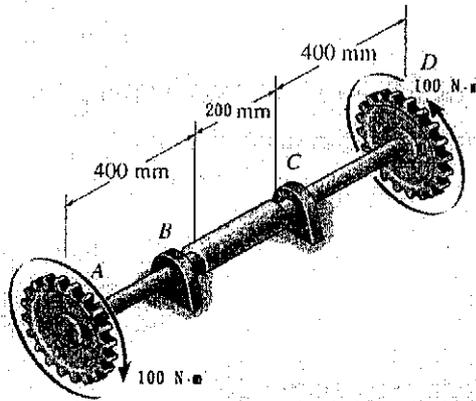
4. The stress at a point is shown on the element. Draw the three Mohr's circles that describe this state of stress, and find the principal stresses and the absolute maximum shear stress.　　　　　　　　　　(20%)
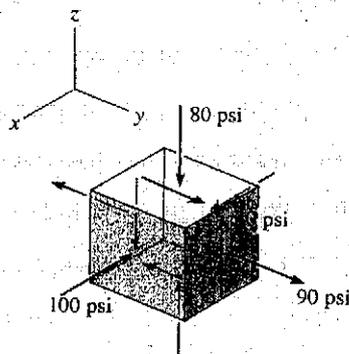
5. Find the movement of pins A and B as shown in following figure, using the PRINCIPLE of VIRTUAL WORK. Take all the members to be linear elastic and to have the same cross-sectional area A and Young's modulus E　　(20%)