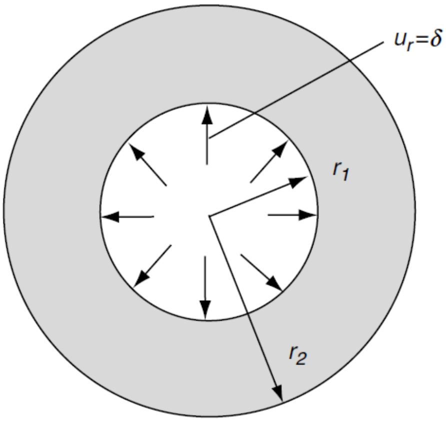
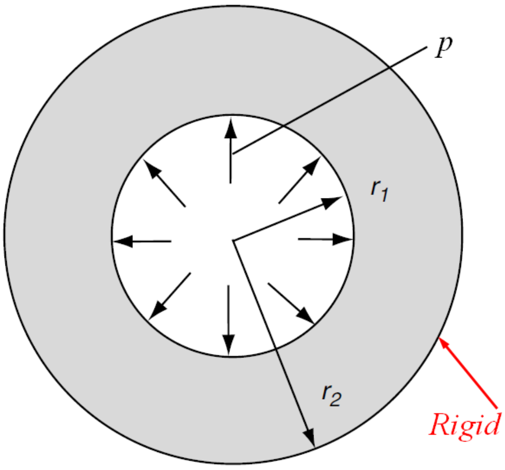
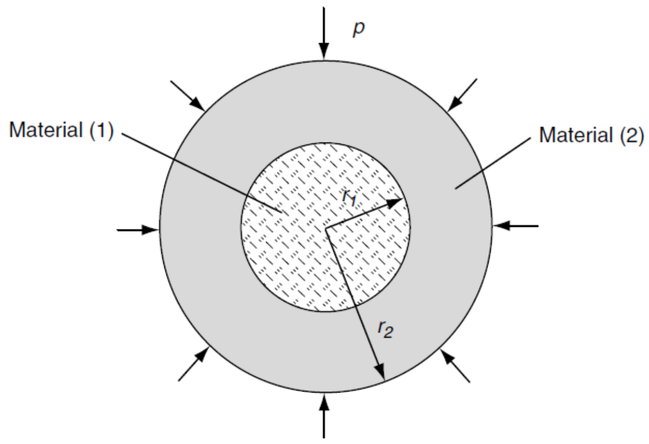
1. Through a *shrink-fit* process, a rigid solid cylinder of radius $r_1+\delta$ is to be inserted into the hollow cylinder of inner radius r_1 and outer radius r_2 (as shown in the following figure). This process creates a displacement boundary condition $u_r(r_1) = \delta$. The outer surface of the hollow cylinder is to remain stress free. Assuming plane strain conditions, determine the resulting stress field within the cylinder.



2. In class, we solved the problem of a thick-walled cylinder subjected to a uniform pressure on both the inner and outer boundary. Resolve this problem by replacing the traction boundary condition on the outer radius r_2 with a zero-displacement condition, i.e. $u_r(r_2) = 0$.



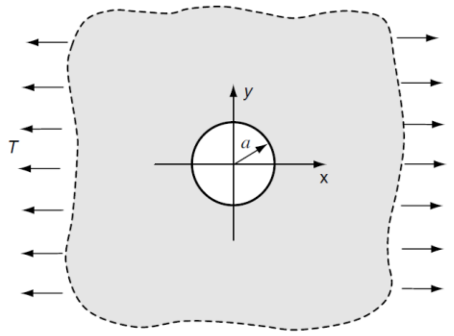
3. A long composite cylinder is subjected to the external pressure loading as shown. Assuming idealized perfect bonding between the two materials, i.e. the normal stress and displacement will be continuous across the interface $r = r_1$. Under these conditions, determine the stress and displacement fields in each material.

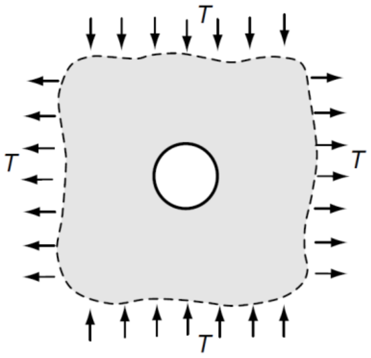


4. Solve the rotating disk problem for the case of an annular disk with inner radius a and outer radius b being stress free. Explicitly show that for the case $b >> a$, the maximum stress is approximately twice that of the solid disk.

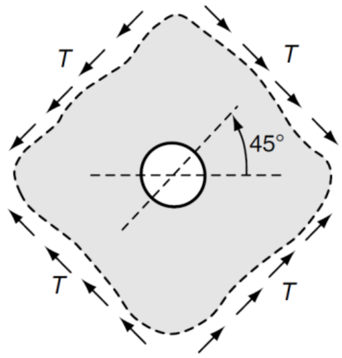
5. (Optional) Using superposition of the stress field for the uni-axial tension problem described below, develop the solution for the equal but opposite biaxial loading on a stress-free hole shown in (a). Also justify that this solution will solve the shear loading case shown in the Figure (b).

   Construct a polar plot of $\sigma_\theta(a,\theta)/T$ for this case.





(a) Biaxial Loading



(b) Shear Loading