TAM 451: Intermediate Solid Mechanics
Homework 6 - Due Friday December 15th at 3pm (under my office door is fine).

Question 1. To measure the properties of rocks in the environment deep within the earth’s crust, geologists do experiments under high pressure loading conditions. Such experiments are commonly done inside a thick walled pressure vessel. Suppose the material of such a vessel is steel with a yield strength of 450 MPa. The inside diameter of the cylinder is 12 cm and the wall thickness is 5 cm. Assume plane strain deformation and no strain hardening.

(a) At what pressure $p_y$ will the material first yield plastically? (Hint: You will want to refer to your class notes for the solution to the boundary value problem for a thick-walled cylinder.)
(b) What is the limit pressure $p_L$ for the vessel?
(c) At what pressure will plastic yielding have spread halfway across the wall?