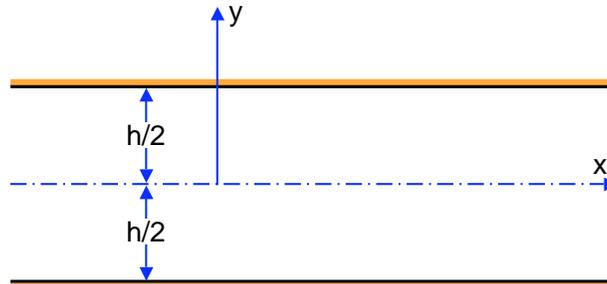


Problem 160C

Consider the steady, fully-developed, planar Poiseuille flow of an incompressible, non-Newtonian fluid in the direction, x :



The constitutive laws of this particular, non-Newtonian fluid are:

$$\sigma_{xx} = \sigma_{yy} = -p$$

$$\sigma_{xy} = -c \left[\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y} \right]^2 \quad \text{for } y > 0$$

$$\sigma_{xy} = +c \left[\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y} \right]^2 \quad \text{for } y < 0$$

where p is the conventional fluid pressure. Determine the mean velocity of flow, \bar{u} , in terms of the spacing, h , the pressure gradient, $(-dp/dx)$, and the constant c .