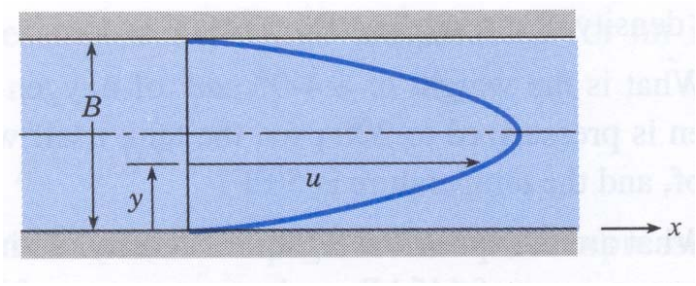
057:20 **Quiz # 1** **08/30/2006**

Suppose that glycerin is flowing (T =20°C) and that the pressure gradient dp/dx is $-1.6kN/m^3$. What are the shear stress and velocity at the lower wall (y = 0) if the space B between the walls is $5.0cm$? The velocity distribution for viscous flow between stationary plates is

$$u = -\frac{1}{2\mu}\frac{dp}{dx}\left(By - y^2\right)$$



Solution:

At the lower wall, y = 0

$$u_{y=0} = -\frac{1}{2\mu}\frac{dp}{dx}\left(By - y^2\right) = 0$$

$$\frac{du}{dy} = -\frac{1}{2\mu}\frac{dp}{dx}\left(B - 2y\right)$$

$$\tau = \mu\frac{du}{dy} = -\frac{1}{2}\frac{dp}{dx}\left(B - 2y\right)$$

$$\tau_{y=0} = -\frac{1}{2}\times\left(-1.6\right)\times\left(0.05 - 0\right) = 0.04\,N/m^2$$