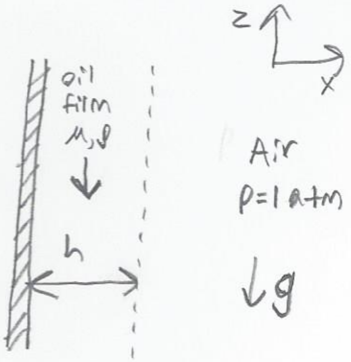
(1)



Constant ρ, μ

$V_x = 0$

$V_y = 0$

$V_z = f(x, \cancel{y}, \cancel{z})$

Steady flow

$$\rho\left[\cancel{\frac{\partial V_z}{\partial t}}^{0} + V_x\cancel{\frac{\partial V_x}{\partial x}}^{0} + V_y\cancel{\frac{\partial V_x}{\partial y}}^{0} + V_z\cancel{\frac{\partial V_x}{\partial z}}^{0}\right] = -\cancel{\frac{\partial P}{\partial z}}^{0} + \mu\left[\frac{\partial^2 V_z}{\partial x^2} + \cancel{\frac{\partial^2 V_z}{\partial y^2}}^{0} + \cancel{\frac{\partial^2 V_z}{\partial z^2}}^{0}\right] + \rho g_z$$

$$-\mu \frac{\partial^2 V_z}{\partial x^2} = \rho g_z \qquad \frac{\partial V_z}{\partial x} = \frac{-\rho g_z}{\mu} x + C_1$$

BC

$V_z(x=0) = 0$

$\tau_{xz}(x=h) = 0$

$$\tau_{xz} = -\mu\left[\cancel{\frac{\partial V_x}{\partial z}}^{0} + \frac{\partial V_z}{\partial x}\right]$$

$$\tau_{xz} = -\mu \frac{\partial V_z}{\partial x}$$

$$\tau_{xz} = +\cancel{\mu}\left[\frac{+\rho g_z}{\cancel{\mu}} x + C_1\right]$$

$$0 = \rho g h + C_1 \Rightarrow C_1 = -\rho g h$$

$$\frac{\partial V_z}{\partial x} = \frac{-\rho g}{\mu} x - \rho g h$$

$$V_z = \frac{-\rho g}{2\mu} \cdot x^2 - \rho g h x + C_2$$

$$0 = 0 + C_2 \Rightarrow C_2 = 0$$

$$\boxed{V_z = \frac{-\rho g}{2\mu} x^2 - \rho g h x}$$