5 (viscosity) cont

$$\tau = \mu \frac{dV}{dy}$$

μ → viscosity

$$\tau = \frac{F}{A} \rightarrow \left[\frac{mL}{L^2 T^2}\right]$$

$$\frac{dV}{dy} = \left[\frac{L/T}{L}\right]$$

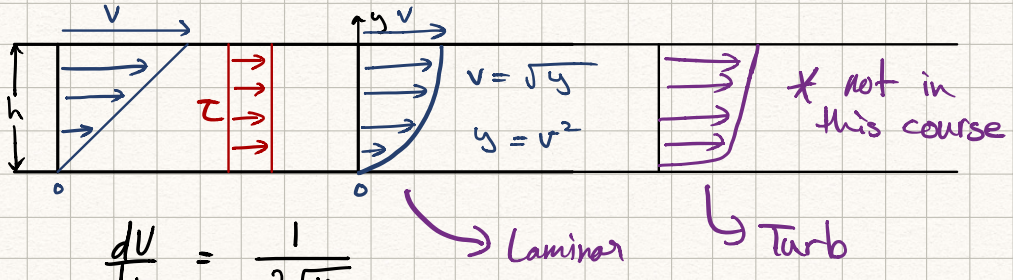
$$\frac{mL}{L^2 T^2} = \mu \left[\frac{L/T}{L}\right]$$

* Practice Problem
find μ

$$\mu \left[\frac{\cancel{L}}{\cancel{T}L}\right] = \frac{m\cancel{L}}{L^{\cancel{2}} T^{\cancel{2}}}$$

$$\boxed{\mu = \frac{m}{LT}}$$

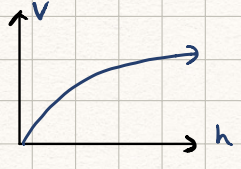
$$\tau = \mu \frac{dV}{dy}$$



$$\frac{dV}{dy} = \frac{1}{2\sqrt{y}}$$

how to find τ?

make the graph



* using previous example

find $\frac{dV}{dy}$

6. Surface Tension

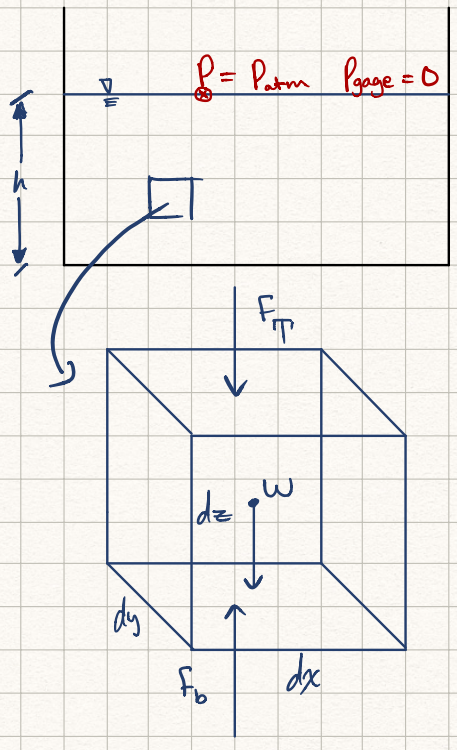
- not really important for CVG
- more on that later

7. Pressure

$P_{atm} = 10^5\ Pa \rightarrow$ in air

$Pa = \frac{N}{m^2} \left[\frac{m\ \frac{L}{T^2}}{L^2}\right]$ → units in this course

Tank of water



$P_{gage} = P_{abs} - P_{atm}$

$F_b - F_T - w = 0$

$F_b = P_b A_b$

$F_T = P_T A_T$

$w = mg = \rho \forall g$

$P_b A_b = P_b\ dy\,dx$

$P_T A_T = P_T\ dy\,dx$

$\rho \forall g = \rho (dx\,dy\,dz)\, g$

$P_b P_T - \rho g\, dz = 0$

$$\boxed{\frac{dP}{dz} = -\rho g}$$

Hydrostatic Pressure

$$\frac{dP}{dz} = -\rho g$$

$$\int_{P_0}^{P_1} dP = \int_{z_0}^{z_1} -\rho g \, dz$$

$$P\Big|_{P_0}^{P_1} = -\rho g \, z\Big|_{z_0}^{z_1}$$

$$\Rightarrow \Delta P = \rho g h \quad / \; h = z_0 - z_1$$