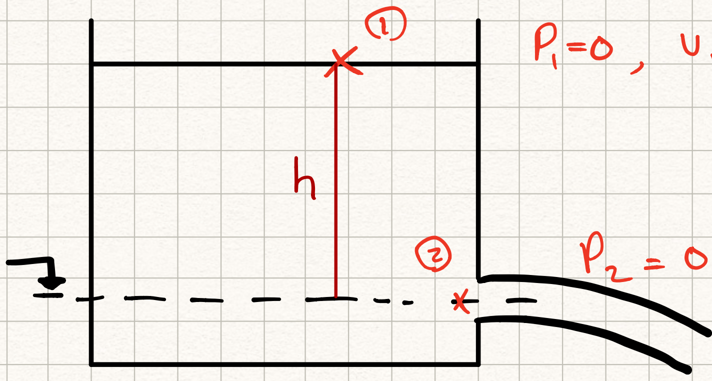
Bernullie Equation



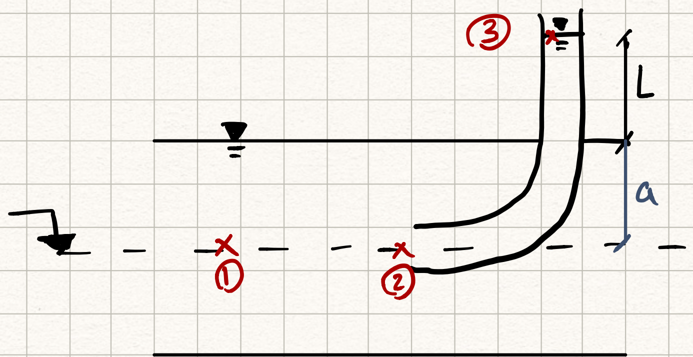
$P_1 = 0, \quad v_1 = 0, \quad z_1 = h$

$P_2 = 0, \quad V_2 = ?, \quad z_2 = 0$

$$h_1 = h_2$$

$$\cancelto{0}{\frac{P_1}{\gamma}} + \cancelto{0}{\frac{V_1^2}{2g}} + z_1 = \cancelto{0}{\frac{P_2}{\gamma}} + \frac{V_2^2}{2g} + \cancelto{0}{z_2}$$

$$v_2 = \sqrt{2gh}$$



$V_1 = V$ $V_2 = 0$

$P_1 =$ $P_2 =$

$z = 0$ $P_3 =$

$h_1 = h_2$ (1)

$$\frac{P_1}{\gamma} + \cancelto{0}{z_1} + \frac{v_1^2}{2g} = \frac{P_2}{\gamma} + \cancelto{0}{z_2} + \cancelto{0}{\frac{v_2^2}{2g}}$$

Σ.Σ.

$$P_2 \pm \Sigma \gamma h = P_3$$

$$P_2 - \gamma a - \gamma L = 0$$

$$P_2 = \gamma (a + L) \quad (2)$$

$$P_1 = \gamma a$$

(2) → (1)

$$\frac{P_1}{\gamma} + \frac{v_1^2}{2g} = (a + L)$$

$$\cancel{a} + \frac{v^2}{2g} = \cancel{a} + L$$

$$L = \frac{v^2}{2g}$$

Continuity equation

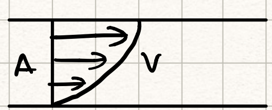
Volumetric Discharge / flow

$$Q\ \left(\frac{m^3}{s}\right) = \frac{\Delta V}{\Delta T} = vA$$

$$Q = \frac{\Delta V}{\Delta t}, \quad \Delta V = A \Delta L \; \Big\} \; Q = \frac{\Delta L}{\Delta t}(A) = vA$$

$\bar{v}$ = avg velocity

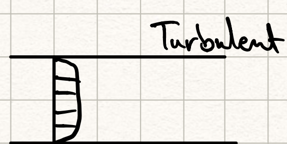
$v \neq$ uniform



$$Q = \int v\, dA = \bar{v}A$$

$$Q = \int v\, dA$$

$$Q = vA$$



Q = Constant

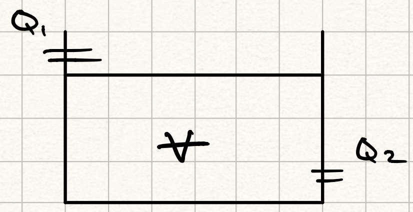
$$Q_1 = Q_2$$

$$v_1 A_1 = v_2 A_2$$

Steady flow ← In this course $Q = const$

Unsteady flow $Q \neq constant$

Resovoir / Tanks



System ⇒ Control Volume (C$\forall$)