Day - 5

→ mass and momentum conservation

$$\left.\frac{dm}{dt}\right|_{sys} = \frac{\partial}{\partial t}\int_{CV} \rho(1)\, dV + \int_{CS} \rho(1)(\vec{n}\cdot\vec{v})\, dA$$

(1) ↓ some intensive property

$$\left.\frac{d\vec{p}}{dt}\right|_{sys} = \frac{\partial}{\partial t}\int_{CV} \rho\vec{v}\, dV + \int_{CS} \rho\vec{v}(\vec{n}\cdot\vec{v})\, dA$$

(control volume) (control surface)

→ = 0 (for classical mechanics)

→ $= \Sigma(\vec{F_s} + \vec{F_B})$

$\vec{F_s}$ ↓ surface (pressure)

$\vec{F_B}$ ↓ Body (gravity)

At steady state, the $\frac{\partial}{\partial t}\int \rho(\ldots)\, dV$ term is 0.

Along flow direction:

$$-\rho A_1 v_{x_1}^2 + \rho A_2 v_{x_2}^2 = P_1 A_1 - P_2 A_2 + F_{shear} + F_{reacn}$$