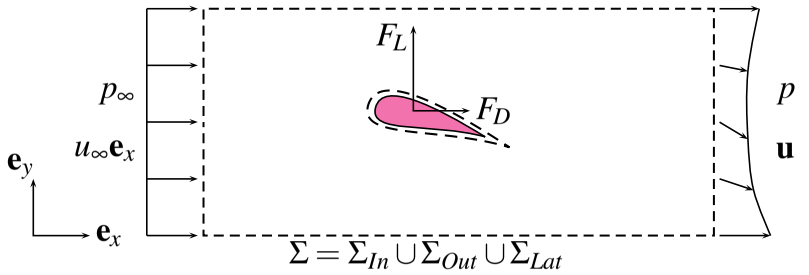
Forces on an body.



$$\begin{cases} F_D = \left(p_\infty + \rho u_\infty^2\right) A_{in} - \int_{\Sigma_{out}} \left(p + \rho u_x^2\right) dA \\ F_L = -\int_{\Sigma_{out}} \rho u_x u_y dA \end{cases}$$

$$\frac{d}{dt}\int_V \rho \mathbf{u} dV + \int_A \rho \mathbf{u}\mathbf{u} \cdot \mathbf{n}\, dA = \int_V \rho \mathbf{f}\, dV + \int_A \boldsymbol{\tau} \cdot \mathbf{n}\, dA$$

$$\int_A \rho \mathbf{u}\mathbf{u} \cdot \mathbf{n}\, dA = -\rho u_\infty^2 A_{in}\, \mathbf{e}_x + \int_{\Sigma_{out}} \rho u_x \mathbf{u} dA + \mathbf{0}$$

$$\int_A \boldsymbol{\tau} \cdot \mathbf{n}\, dA = p_\infty A_{in} \mathbf{e}_x - \int_{\Sigma_{Out}} p \mathbf{e}_x dA - F_D \mathbf{e}_x - F_L \mathbf{e}_y$$