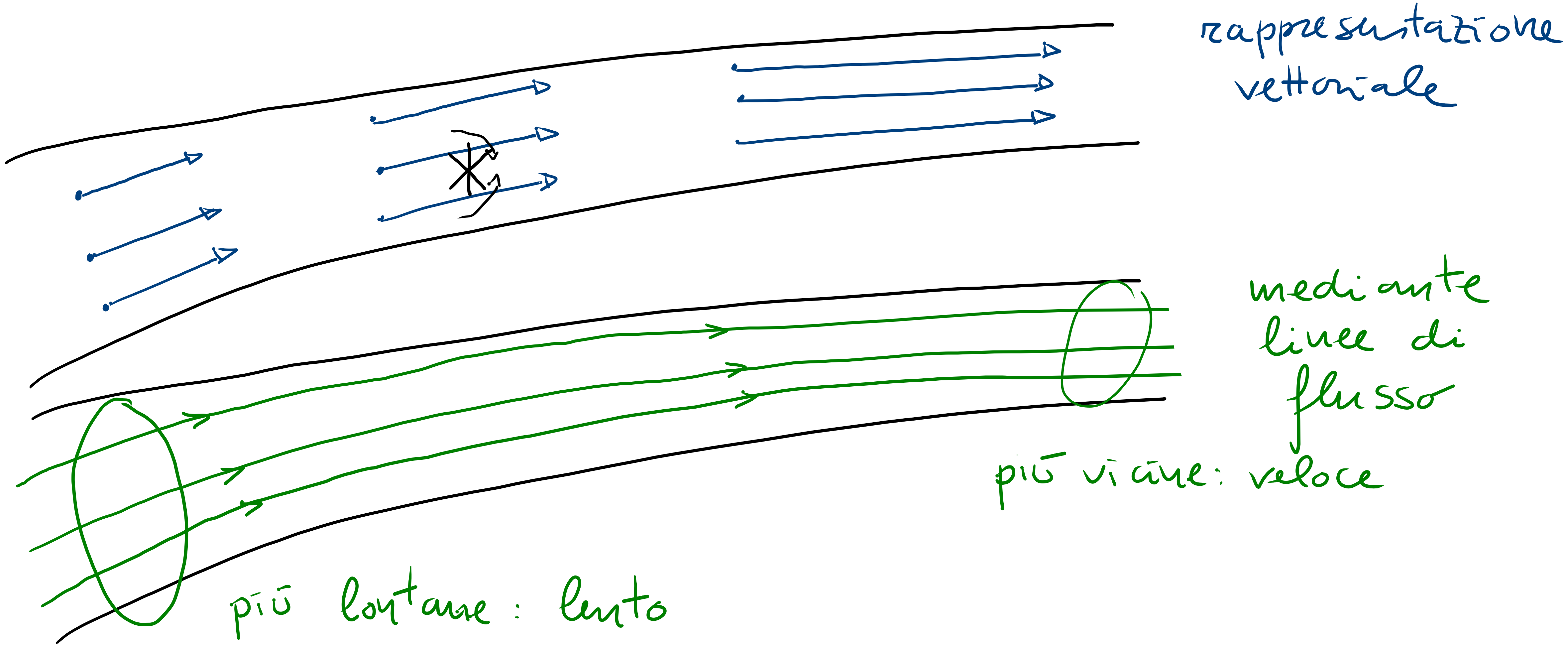
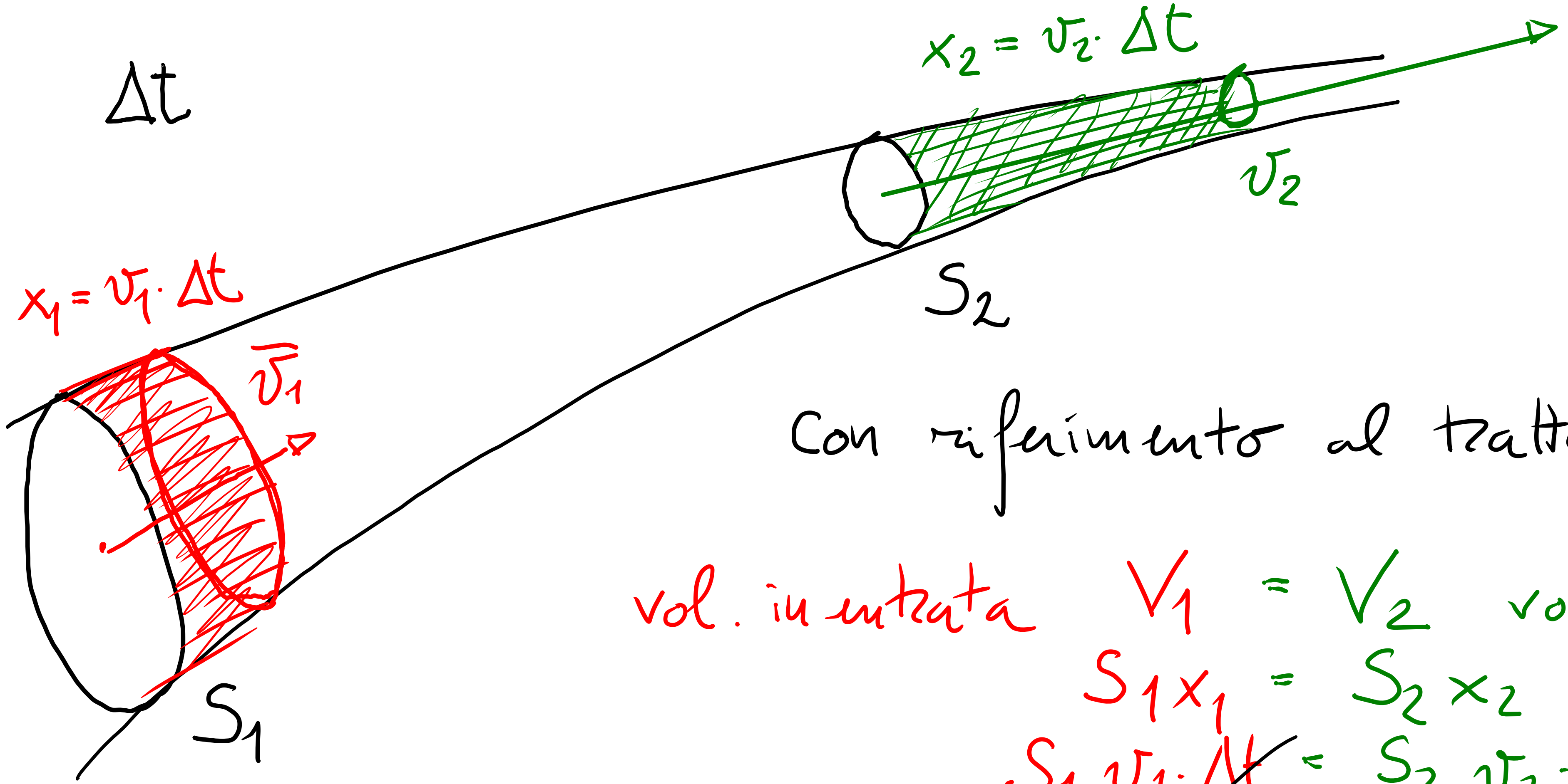
FLUIDODINAMICA

→ fluidi ideali : - incomprimibili ρ cost (liquidi)
- non viscoso $\eta = 0$ (viscosità nulla)
⇒ scorre senza attrito

→ flusso
- stazionario $\vec{v}$ è costante in ogni punto
- irrotazionale un eventuale mulinello non gira



PRINCIPIO DI CONTINUITÀ (Teorema di Leonardo)



Con riferimento al tratto S_1-S_2,

vol. in entrata $V_1 = V_2$ volume in uscita

$$S_1 x_1 = S_2 x_2$$

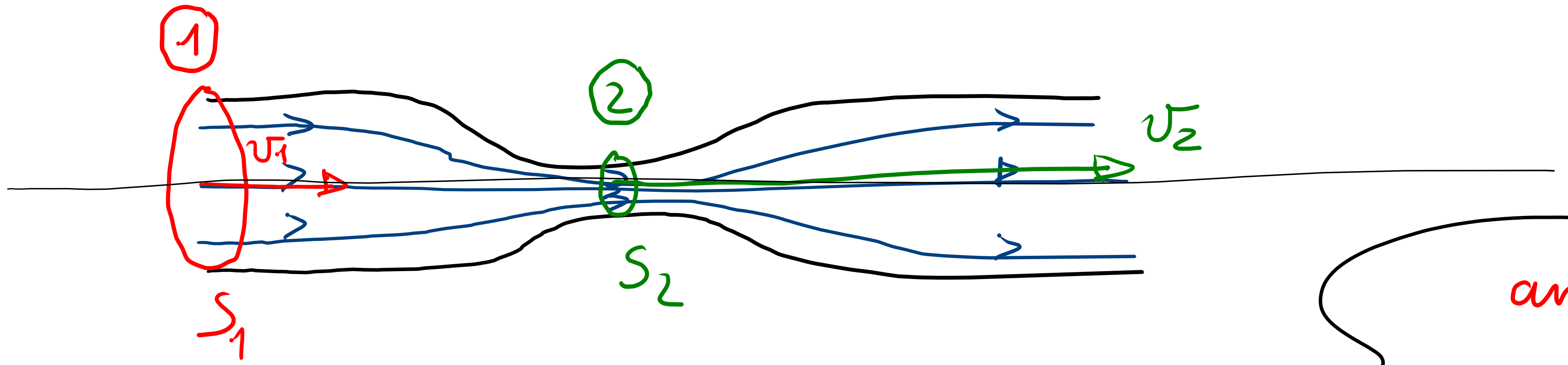
$$S_1 v_1 \cdot \cancel{\Delta t} = S_2 v_2 \cdot \cancel{\Delta t}$$

$$\boxed{S_1 v_1 = S_2 v_2}$$

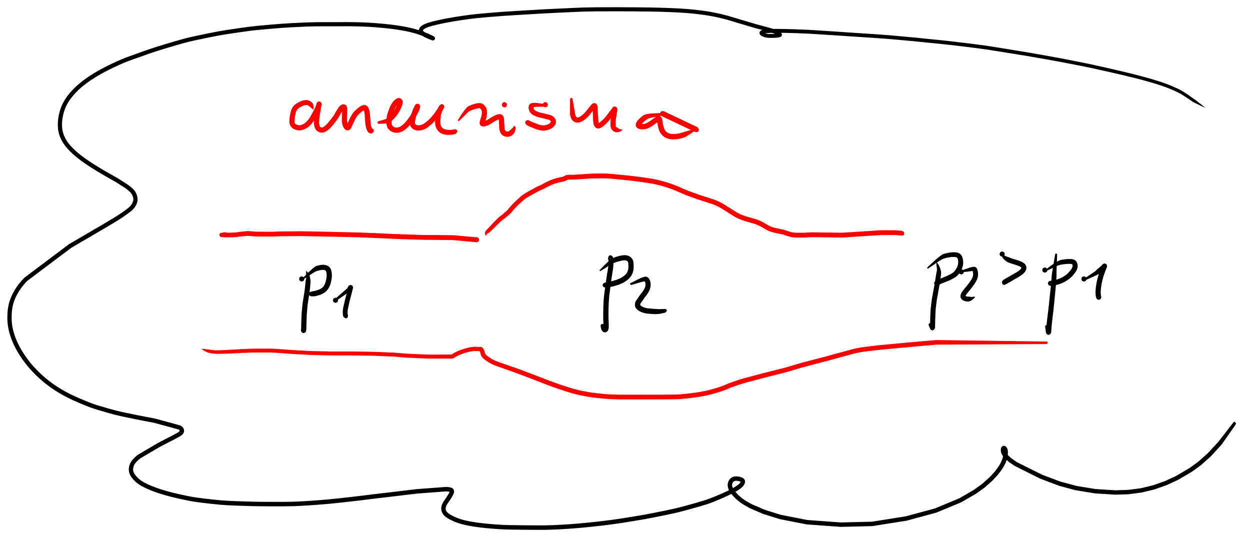
portata in volume $\quad Q = S v \quad$ non varia lungo il flusso

$$[Q] = \frac{m^3}{s}$$

STENOSI in VASO SANGUIGNO



$h_1 = h_2$



$$S_1 > S_2$$

$$Q_1 = S_1 v_1 = S_2 v_2 = Q_2$$

$$v_2 = \underbrace{\frac{S_1}{S_2}}_{>1} v_1 > v_1$$

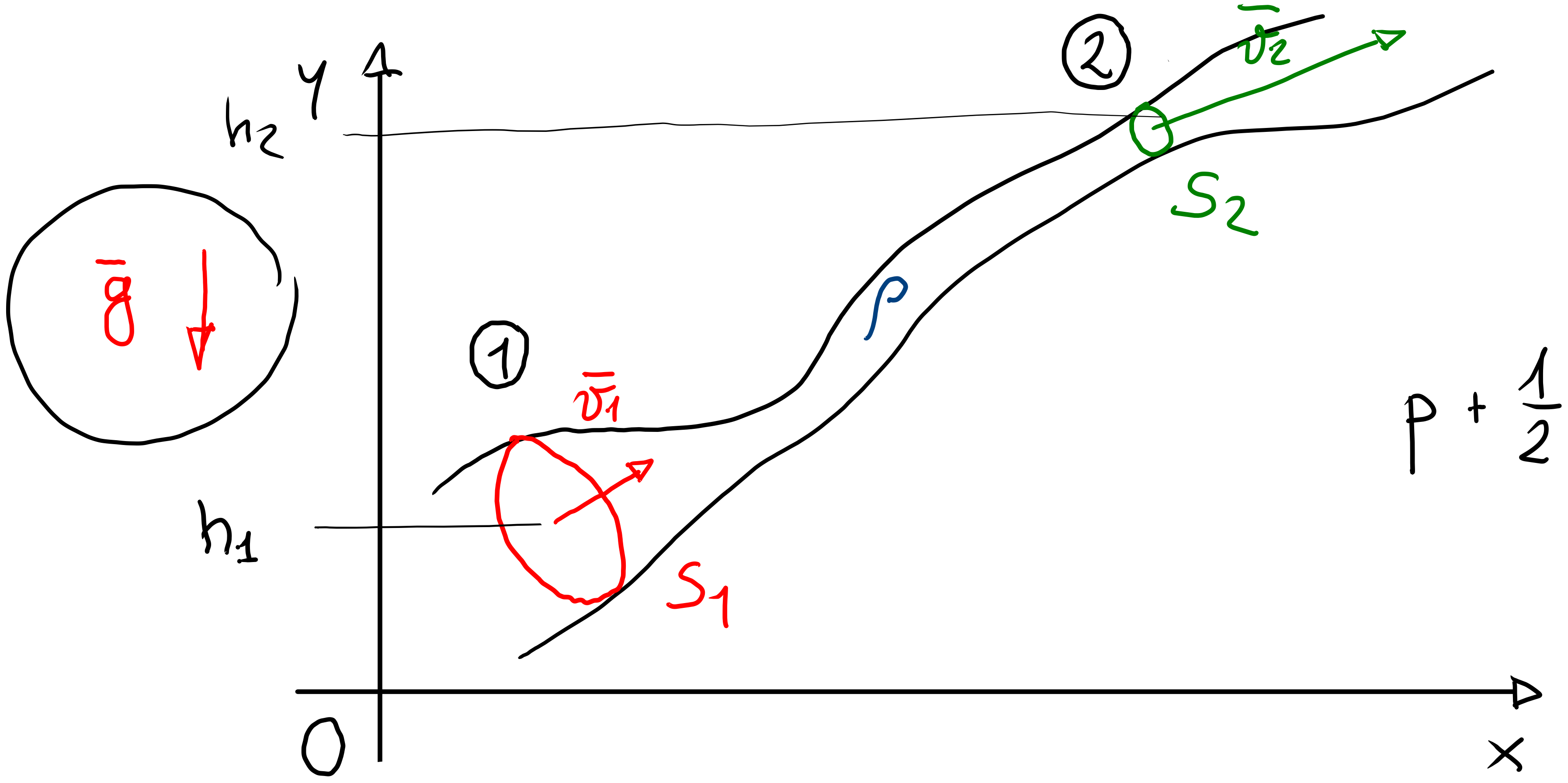
Applico Bernoulli:

$$p_1 + \frac{1}{2}\rho v_1^2 + \cancel{\rho g h_1} = p_2 + \frac{1}{2}\rho v_2^2 + \cancel{\rho g h_2}$$

$$p_2 = p_1 + \frac{1}{2}\rho v_1^2 \underbrace{\left(1 - \underbrace{\frac{v_2^2}{v_1^2}}_{>1}\right)}_{<0}$$

$$p_2 < p_1$$

TEOREMA DI BERNOULLI



en. cinetica

en. pot. grav.

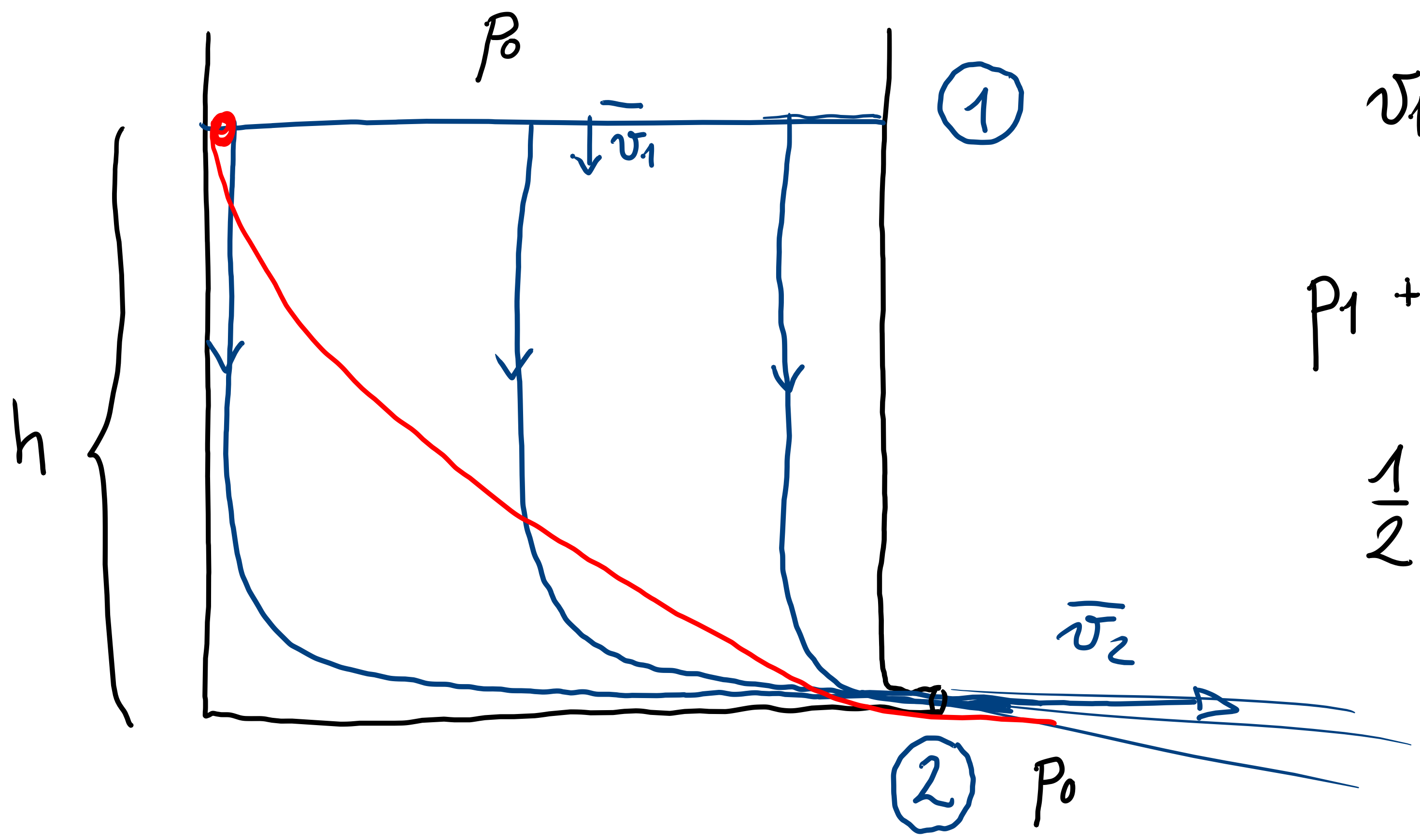
$$p + \frac{1}{2}\rho v^2 + \rho g h \quad \text{invariante}$$

$$p_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

$$\frac{J}{m^3} = \frac{m}{m}\frac{N}{m^2} \qquad \frac{J}{m^3} \qquad \frac{J}{m^3}$$

densità di energia

TEOREMA DI TORRICELLI



$v_1 \ll v_2$

$$p_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

$$\frac{1}{2}\rho v_2^2 \underbrace{\left(1 - \overset{\ll 1}{\frac{v_1^2}{v_2^2}}\right)}_{\sim 1} = \cancel{p_1 - p_2} + \rho g \underbrace{(h_1 - h_2)}_{h}$$

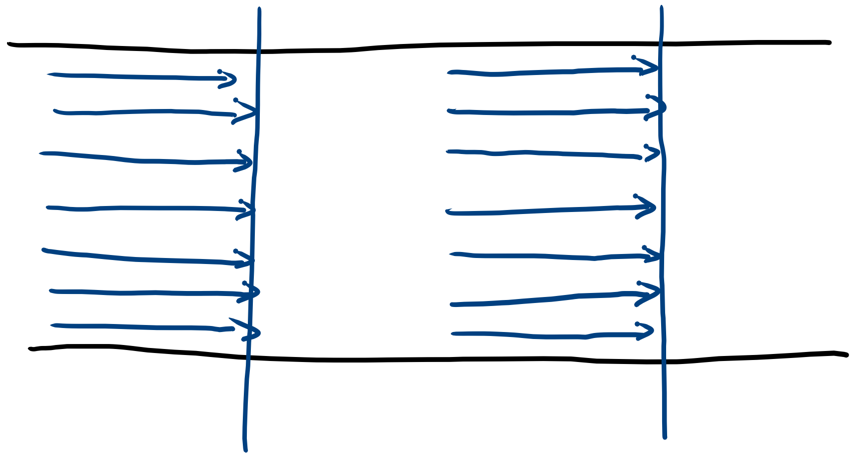
$$p_1 = p_2 = p_0$$

$$\frac{1}{2}\cancel{\rho} v_2^2 = \cancel{\rho} g h$$

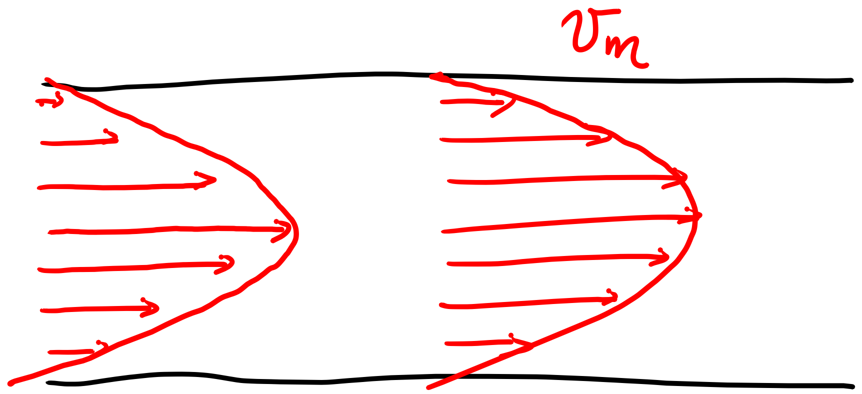
$$v_2 = \sqrt{2gh}$$

FLUIDI "REALI"

ideale



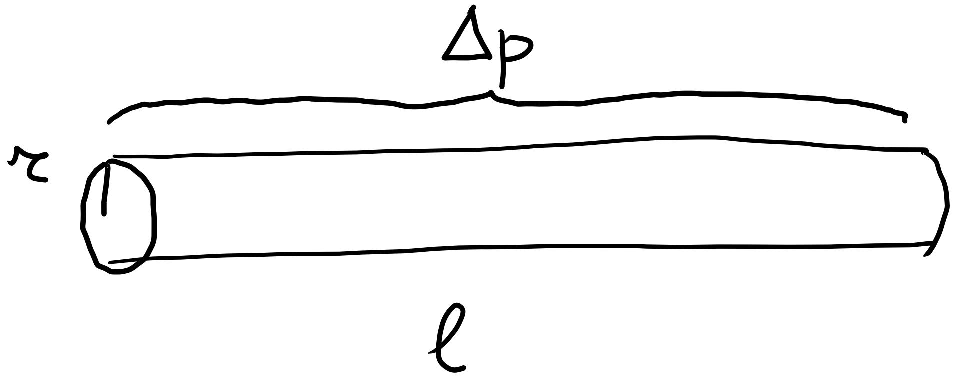
"reale"



$$Q = S v_m \qquad Q_1 = Q_2$$

$$\eta \neq 0$$

Equazione di Poiseuille



$$\boxed{Q = \frac{\pi}{8} \cdot \frac{r^4}{\eta} \cdot \frac{\Delta p}{l}}$$