

Task 4.3

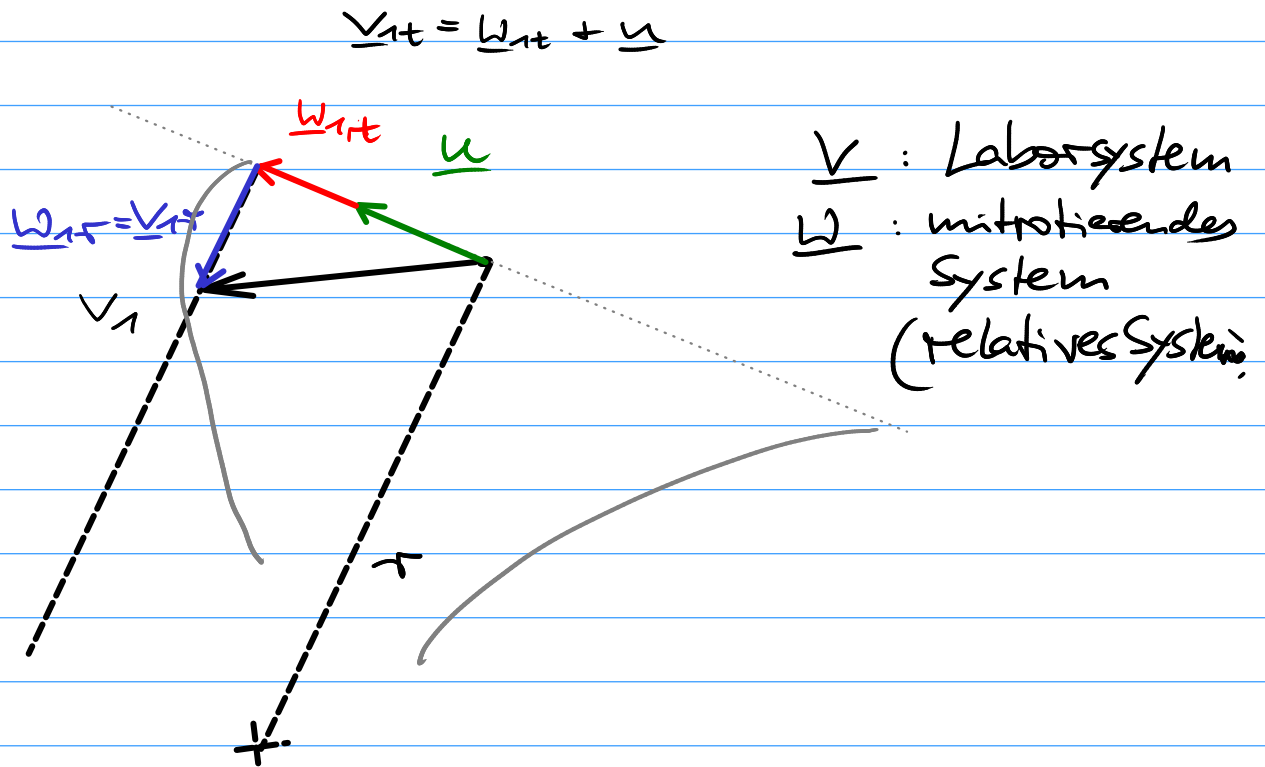
$$P = F_{x,s} \cdot u_0 = \underbrace{\rho h b (1 + \cos \beta)}_C (u - u_0)^2 u_0$$

$$= C (u^2 - 2u u_0 + u_0^2) u_0$$

$$= C (u^2 u_0 - 2u u_0^2 + u_0^3)$$

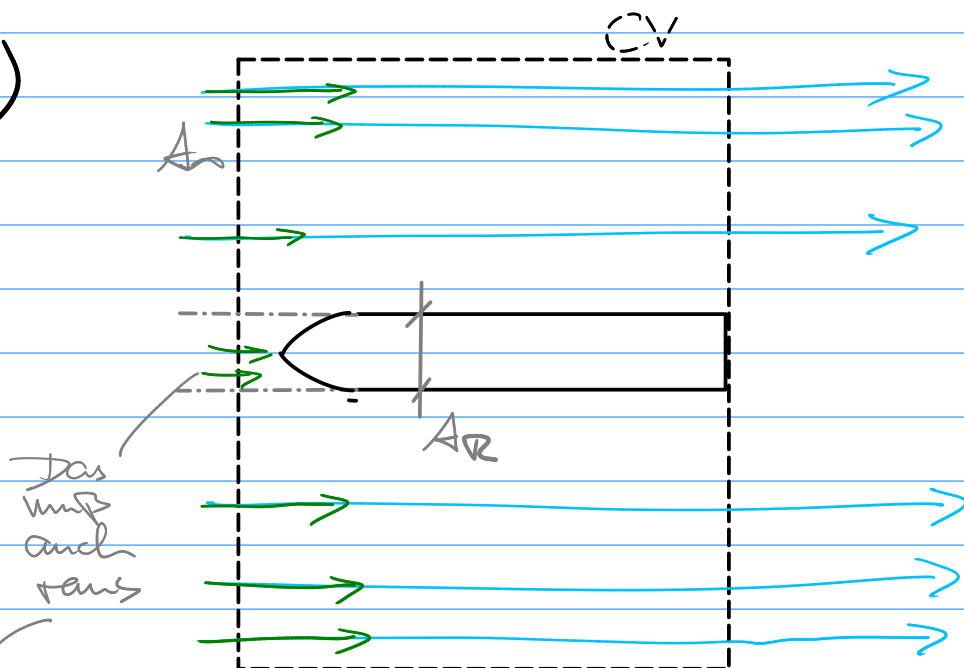
$$\Rightarrow \frac{dP}{du_0} = C (u^2 - 2u u_0 + 3u_0^2)$$

Task 4.6

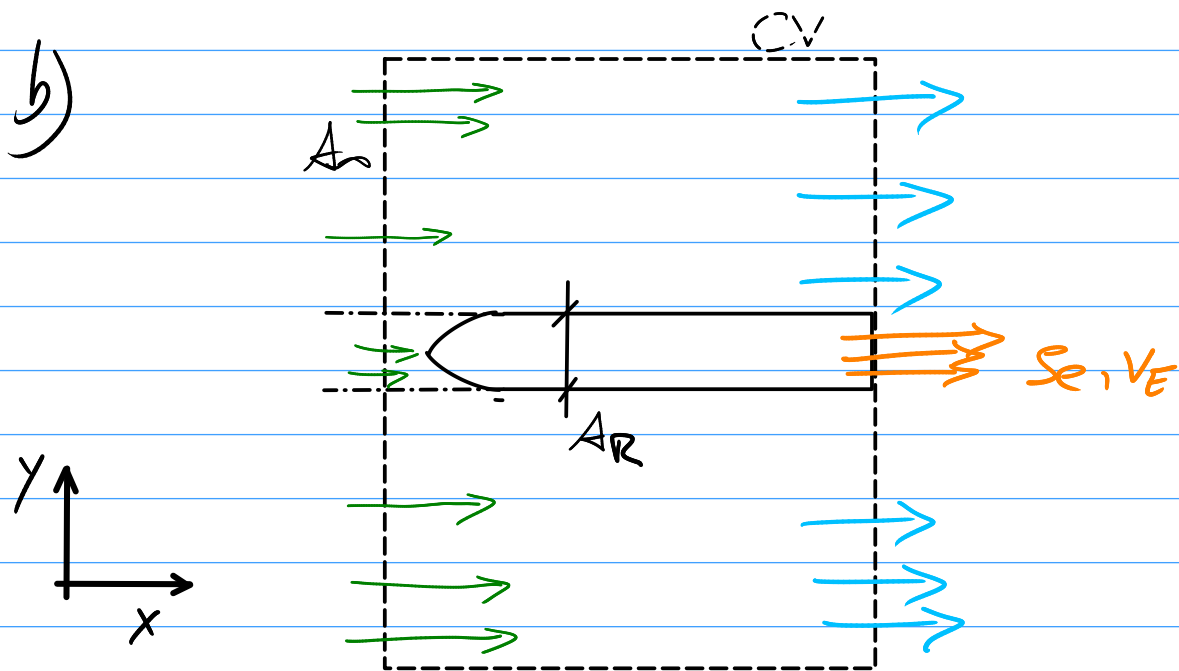


Task 4.4

a)



$$\underbrace{\rho A_\infty v_1}_{\text{"rein"}} = \underbrace{(\rho A_\infty - \rho A_R) v_1}_{\text{"raus"}} + \Delta \dot{m} \Rightarrow \Delta \dot{m} = \rho v_1 A_R$$



Thrust = Force on the rocket.

Momentum eq. \Rightarrow x-component

$$\sum_{out} \dot{m} \underline{V} - \sum_{in} \dot{m} \underline{V} = \underline{F}$$

$$\underbrace{\rho(A_{in} - A_{out}) V_{1x}}_{\dot{m}} V_{1x} + \underbrace{\Delta \dot{m} V_x}_{\dot{m}_E} + \underbrace{(\rho_E A_R V_E)}_{\dot{m}_E} V_{Ex} - \underbrace{(\rho A_{in} V_{1x})}_{\dot{m}_{in}} V_{1x} = F_t$$

What is this velocity?

\Rightarrow Choose CV large enough to have $V_x \approx V_{1x}$

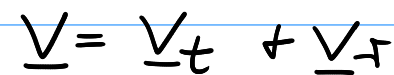
$$F_t = \cancel{\rho A_{in} V_{1x}^2} - \cancel{\rho A_{out} V_{1x}^2} + \cancel{\rho A_R V_{1x}^2} + \rho_E A_R V_E^2 - \cancel{\rho A_{in} V_{1x}^2}$$

$$= \rho_E A_R V_E^2$$

Taschenrechner.

Geschw. d. Fluids

\underline{W} = rotierendes
System
relativen
System



$$\underline{W} = \underline{W}_t + \underline{W}_f$$

u = u_t kein Radialanteil

$$\underline{V} = \underline{u} + \underline{w}$$

$$\Rightarrow \underline{V}_t = \underline{u} + \underline{w}_t$$

$$\underline{V}_T = \underline{W}_T$$