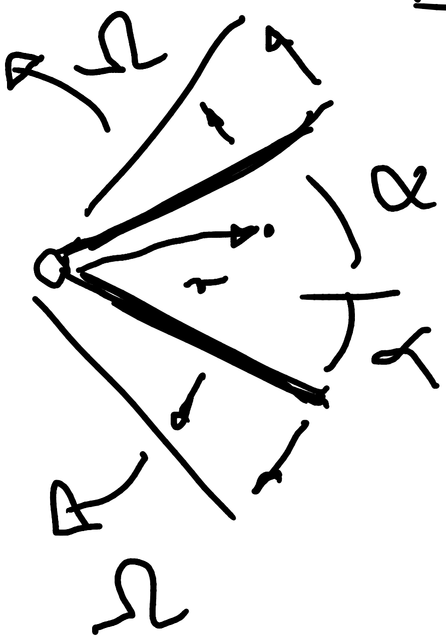
geg



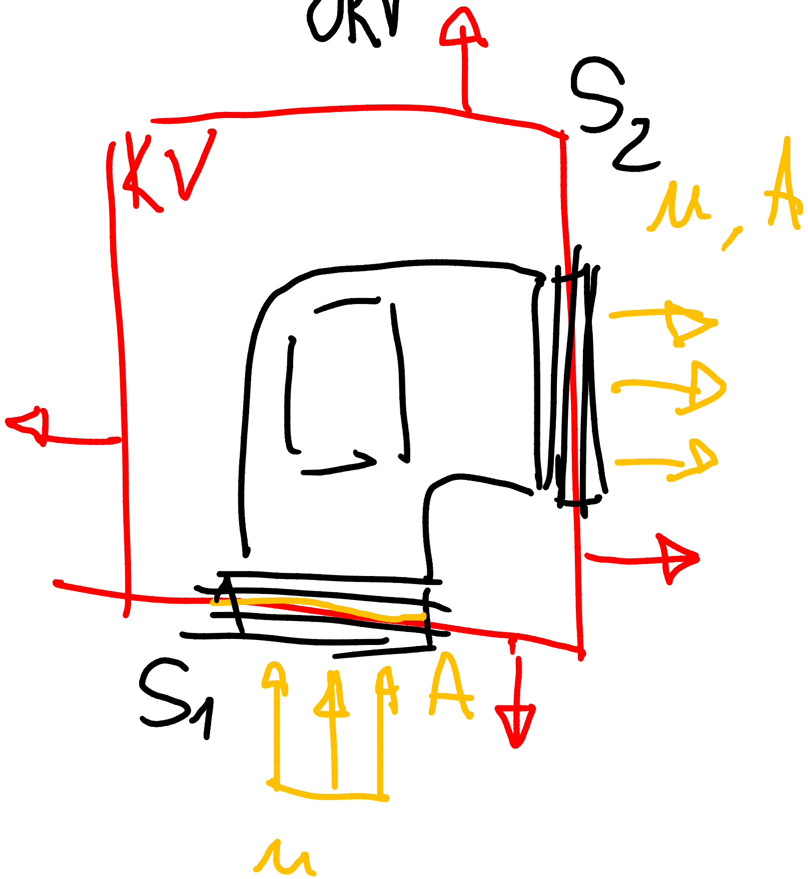
$$\vec{u}_{wo} = \Omega r \vec{e}_\varphi = -\vec{u}_{wu}$$

$$u_r = f(r) \cdot \cos \frac{\pi \varphi}{2\alpha}$$

$$\rho = const$$

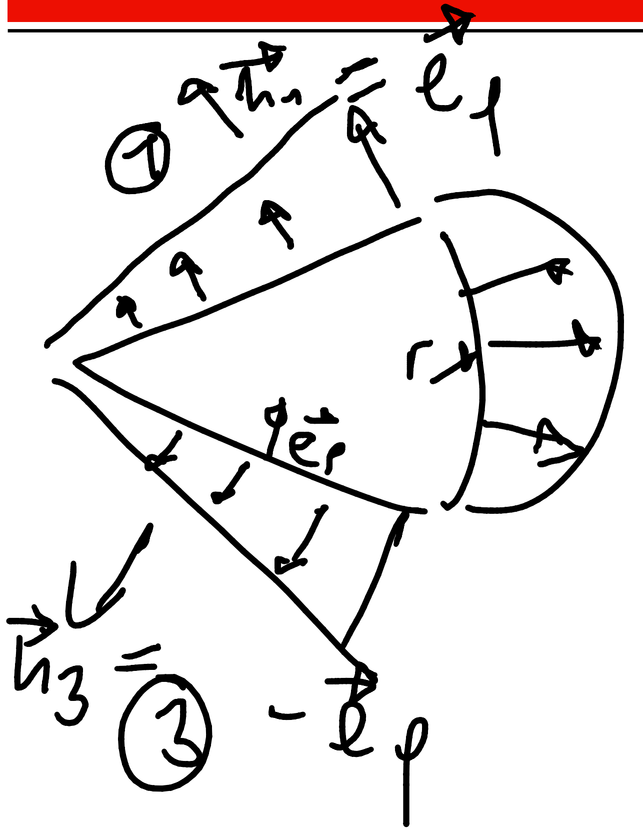
$$\iint_{\partial KV} \vec{u}\cdot\vec{n}\, dS = 0$$

Beispiel: Hydraulik-Rohrecke



$$\int_{S_1} \vec{u}\cdot\vec{n}\, dS + \int_{S_2} \vec{u}\cdot\vec{n}\, dS = 0$$

$$-uA + uA = 0$$



$$\vec{n}_2 = \vec{e}_r$$

$$\underbrace{\int_0^r \Omega r\, \vec{e}_\varphi \cdot \vec{e}_\varphi \, dr}_{①} + \underbrace{\int_{-\alpha}^{+\alpha} r f(r) \cos\frac{\pi\varphi}{2\alpha}\, \vec{e}_r \cdot \vec{e}_r \, d\varphi}_{②}$$

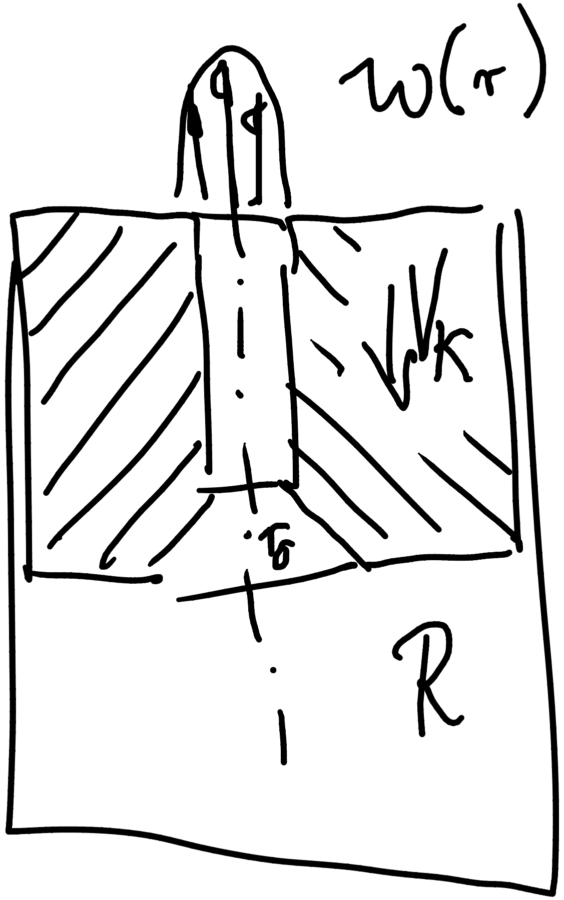
$$+ \underbrace{\int_0^r -\Omega r\, \vec{e}_\varphi \cdot (-\vec{e}_\varphi)\, dr}_{③} = 0$$

① $\int_0^r \Omega \bar{r}\, d\bar{r} = \frac{1}{2}\Omega r^2$

② $\int_{-\alpha}^{+\alpha} f(r) \cos\frac{\pi \varphi}{2\alpha}\, r\, d\varphi = f(r)\, r \left[\sin\frac{\pi\varphi}{2\alpha}\right]_{-\alpha}^{+\alpha} \frac{2\alpha}{\pi} = \frac{4\alpha}{\pi} f(r)\cdot r$

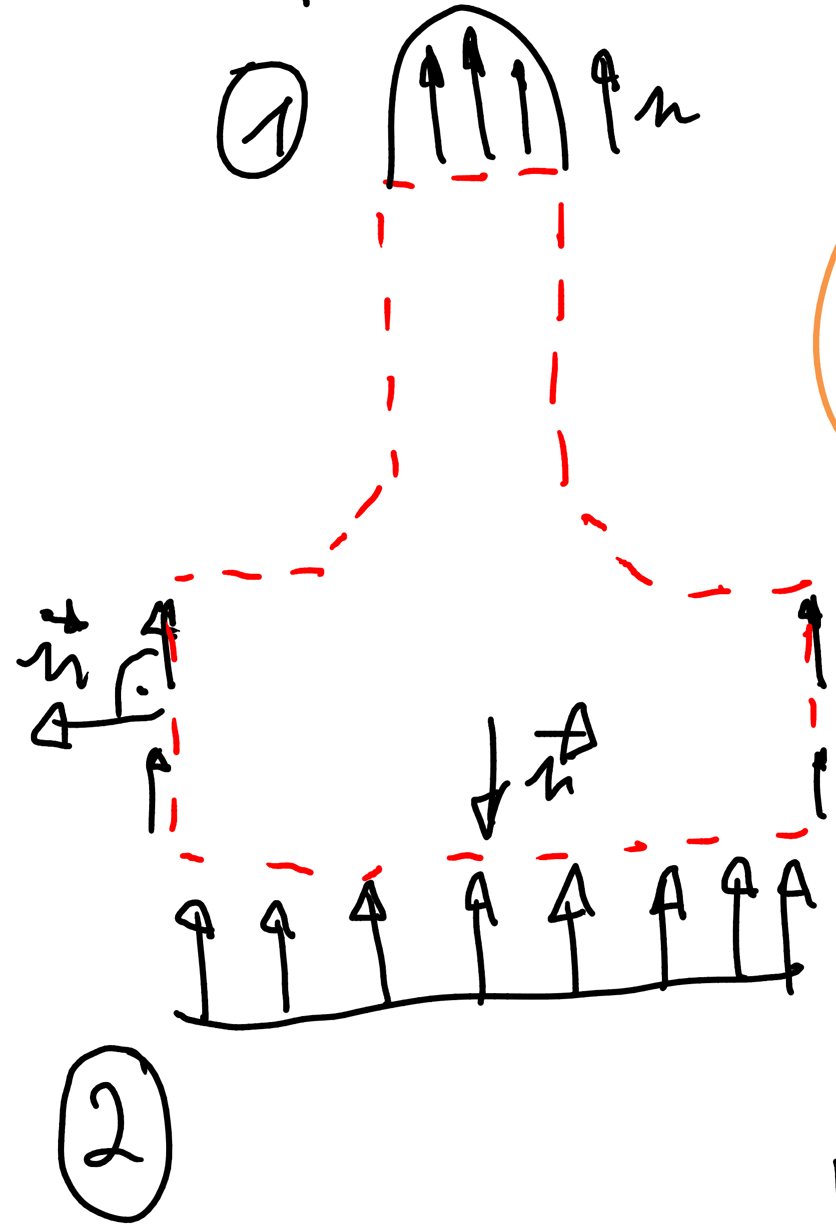
$\Omega r^2 + \frac{4\alpha}{\pi} f(r)\cdot r = 0$

$$f(r) = -\frac{\Omega r \pi}{4\alpha}$$



$$w(r) = W\left[1 - \left(\frac{r}{r_0}\right)^2\right]$$

kolbenfestes Koordinatensystem



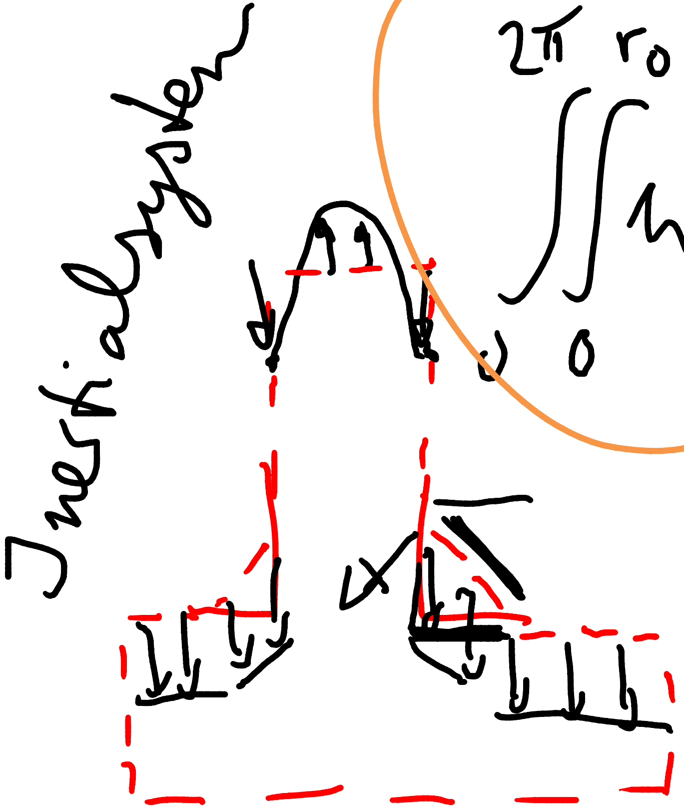
$\vec{e}_x \cdot \vec{e}_x = 1$

$e_x \cdot \vec{e}_y = 0$

$$\int_0^{2\pi}\int_0^{r_0} w\left[1-\left(\frac{r}{r_0}\right)^2\right] \underbrace{r\,dr\,d\varphi}_{dA} - \int_0^{2\pi}\int_0^{R} V_K \, r\,dr\,d\varphi = 0$$

$$2\pi w \frac{r_0^2}{4} = \pi R^2 V_K$$

$$w = 2V_K \cdot \left(\frac{R}{r_0}\right)^2$$



$$\int_0^{2\pi}\int_0^{r_0} w\left[1-\left(\frac{r}{r_0}\right)^2\right]-V_K \, r\,dr\,d\varphi \;-\int_0^{2\pi}\int_{r_0}^{R} V_K\, r\,dr\,d\varphi = 0$$