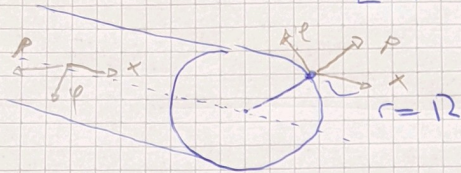


Serie 3

Fehler HL

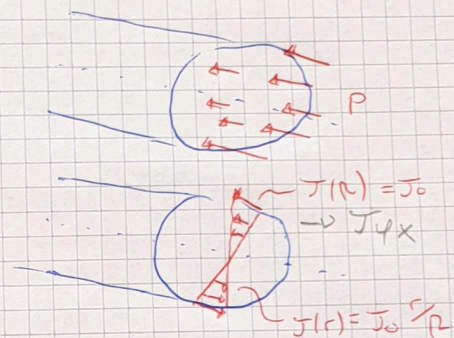
S2 a)

$$[\underline{I}]_{r, \varphi, x} = \begin{bmatrix} \sigma_p & \tau_{\varphi p} & \tau_{\varphi x} \\ \tau_{\varphi p} & \sigma_{\varphi} & \tau_{\varphi x} \\ \tau_{\varphi p} & \tau_{\varphi x} & \sigma_x \end{bmatrix}_{r, \varphi, x}$$



$$[\underline{I}]_{r, \varphi, x}^{\text{hydrostatischer Druck}} = \begin{bmatrix} -p & 0 & 0 \\ 0 & -p & 0 \\ 0 & 0 & -p \end{bmatrix}$$

$$[\underline{I}]_{r, \varphi, x}^{\text{Torsion}} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & \tau_0 \\ 0 & \tau_0 & 0 \end{bmatrix}$$



Superpositionsprinzip:

$$[\underline{I}]_{r, \varphi, x}^{\text{Gesamtbelastung}} = [\underline{I}]_{r, \varphi, x}^{\text{hydrostatisch}} + [\underline{I}]_{r, \varphi, x}^{\text{Torsion}} = \begin{bmatrix} -p & 0 & 0 \\ 0 & -p & \tau_0 \\ 0 & \tau_0 & -p \end{bmatrix}$$

$$b) \underline{s} = \underline{I} \cdot \underline{n} = \begin{bmatrix} -p & 0 & 0 \\ 0 & -p & \tau_0 \\ 0 & \tau_0 & -p \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \begin{bmatrix} -p \\ -p \\ \tau_0 \end{bmatrix}$$

$$\sigma = \underline{s} \cdot \underline{n} = \begin{bmatrix} -p \\ -p \\ \tau_0 \end{bmatrix} \frac{1}{\sqrt{2}} \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \frac{1}{\sqrt{2}} = \frac{1}{2} (-p - p) = -p$$

$$\underline{\tau} = \underline{s} - \sigma \underline{n} = \frac{1}{\sqrt{2}} \begin{bmatrix} -p \\ -p \\ \tau_0 \end{bmatrix} - (-p) \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \begin{bmatrix} 0 \\ 0 \\ \tau_0 \end{bmatrix}$$

$$|\underline{\tau}| = \frac{\tau_0}{\sqrt{2}}$$