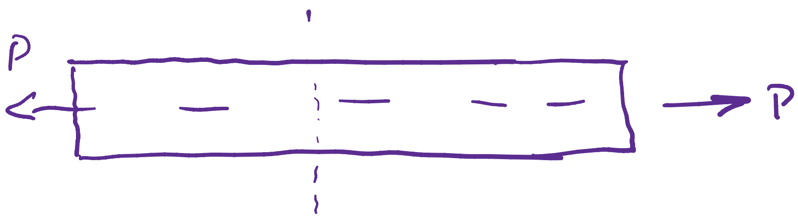
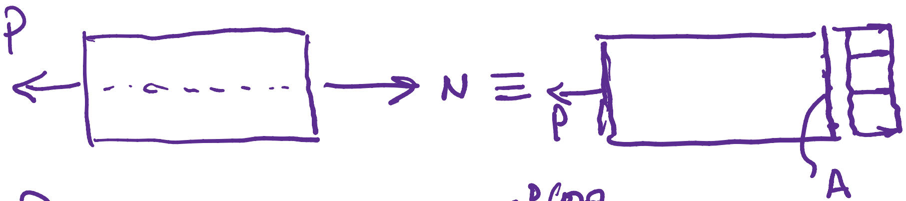
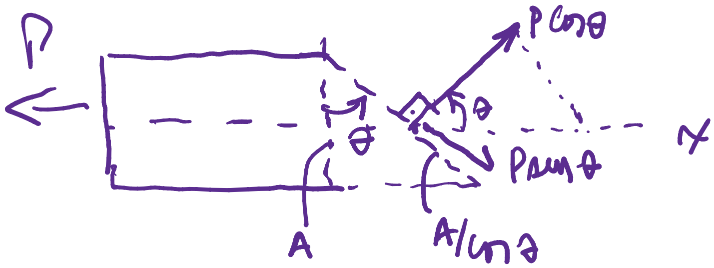
Aula Analise de Tensões - Parte 1

Tuesday, June 2, 2020 7:41 AM

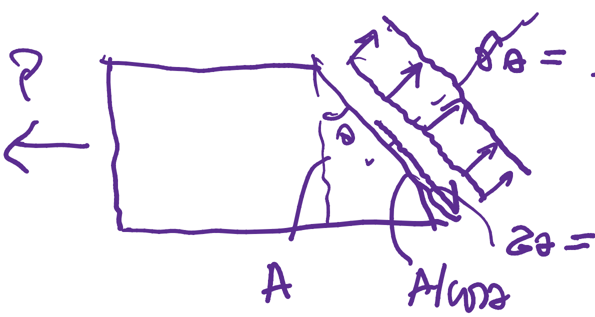




$$\sigma_x = \frac{N}{A} \quad e \quad N = P$$



$$\sigma_x = N/A$$



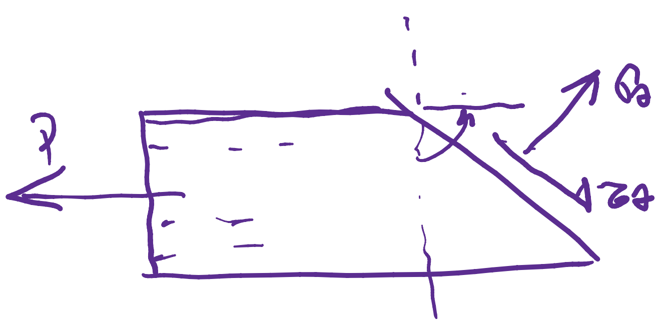
$$\sigma_\theta = \frac{P.\cos\theta}{A/\cos\theta} = \left(\frac{P}{A}\right).\cos^2\theta$$

$$\boxed{\sigma_\theta = \sigma_x . \cos^2\theta}$$

σ_x

$$\tau_\theta = \frac{P.\sin\theta}{A/\cos\theta} = \left(\frac{P}{A}\right).\sin\theta.\cos\theta$$

$$\boxed{\tau_\theta = \sigma_x . \sin\theta.\cos\theta}$$

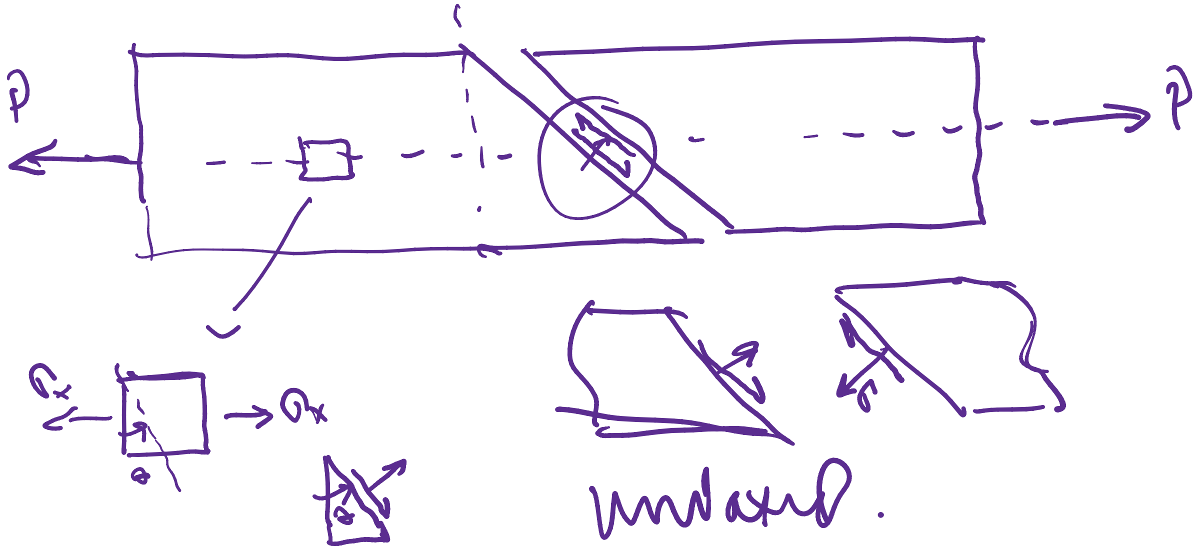


$$\sigma(\theta = 0) = \sigma_x$$

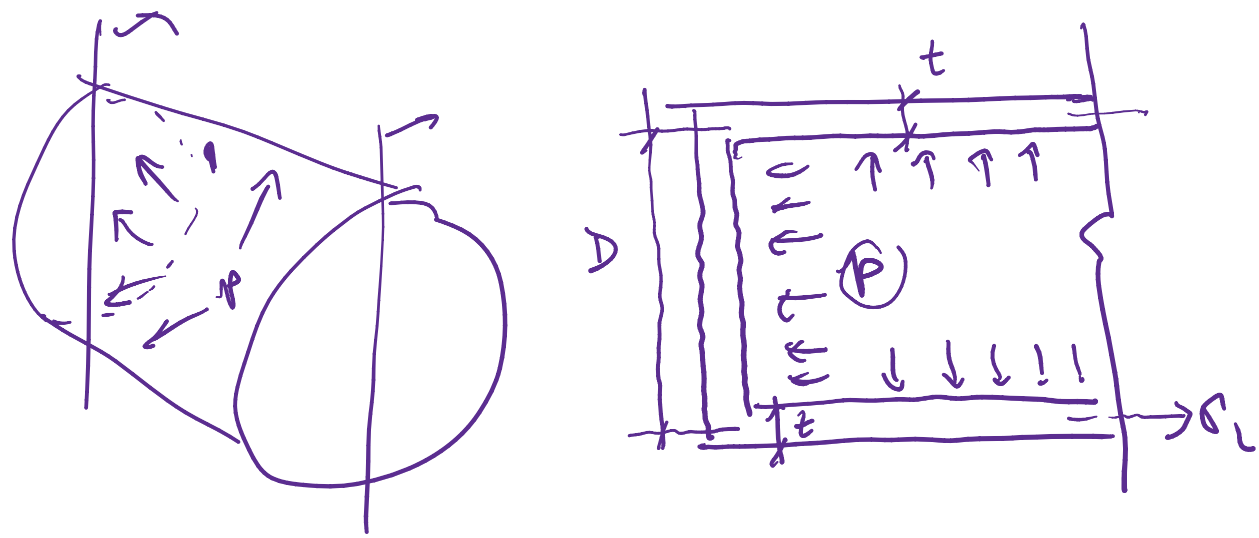
$$\sigma(\theta = 90) = 0$$

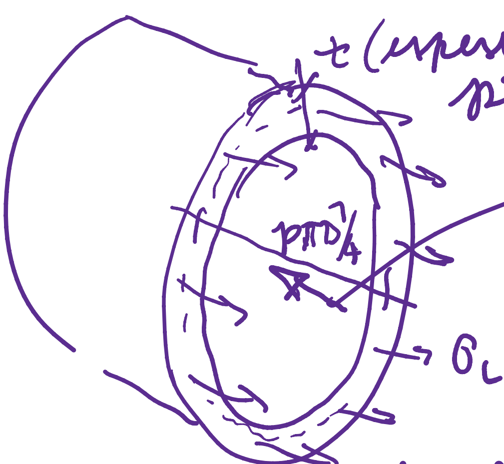
$$\left.\begin{aligned} \tau(\theta = 0) &= 0 \\ \tau(\theta = 90) &= 0 \end{aligned}\right\} \quad \tau(\theta = 45) = \sigma_x . \sin 45 . \cos 45$$

$$\boxed{\tau(\theta = 45) = \sigma_x/2}$$



uniaxial.





t (espessura da parede do vaso de pressão)

força atuante pela pressão interna

$$pA = \frac{p.\pi.D^2}{4}$$

$$\sigma_L . A(\text{anel}) = \sigma_L (\pi D \times t)$$

Equilíbrio longitudinal

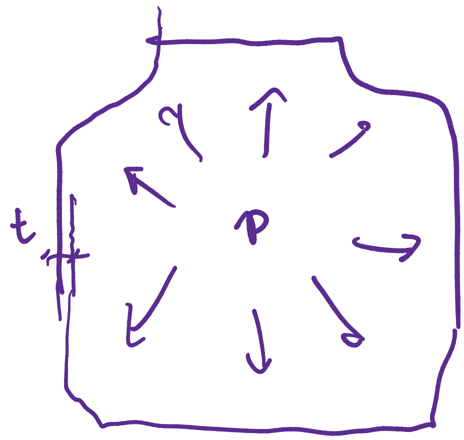
$$\boxed{\sigma_L \cdot \cancel{\pi} \cancel{D} \cdot t = \frac{p.\cancel{\pi}.D^{\cancel{2}}}{4} \qquad \sigma_L = \frac{pD}{4t}}$$

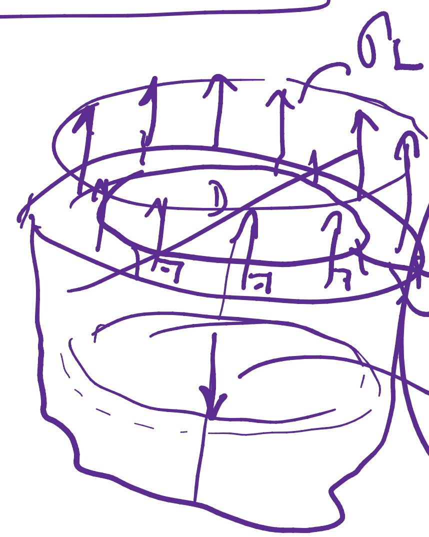
$$\sigma_L \cdot \pi \cancel{D} t = \frac{p \cdot \pi \cdot D^2}{4}$$

$$\sigma_L = \frac{p \cdot D}{4t} = \frac{p \cdot 2r}{4t} = \frac{pr}{2t}$$

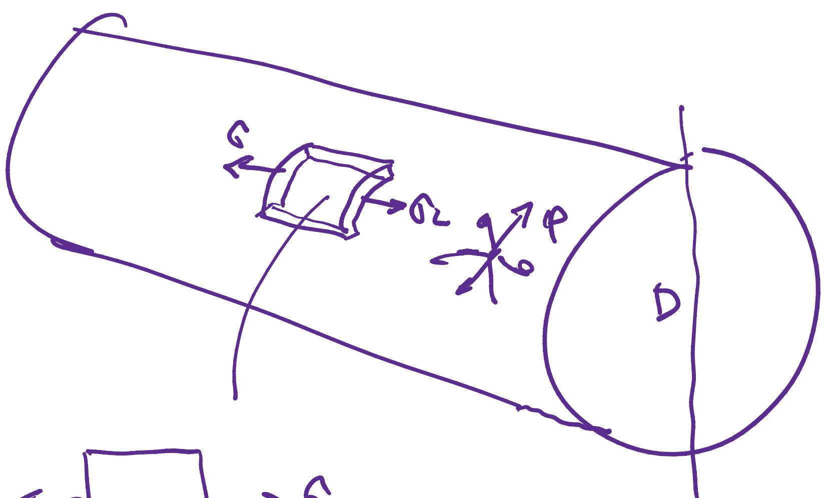
$$\sigma_L = \frac{pD}{4t}$$

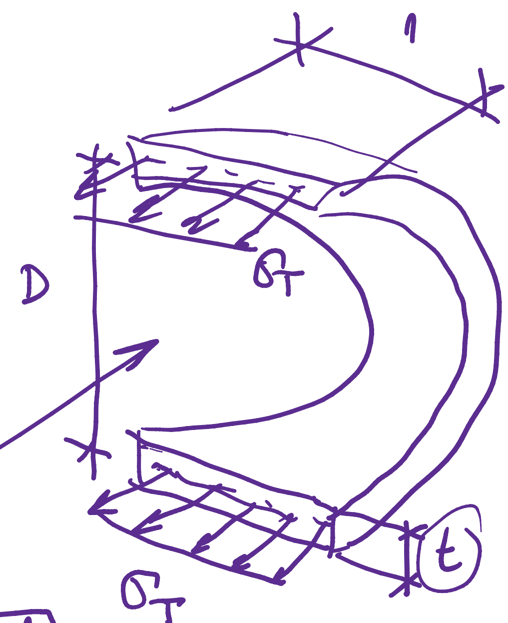
$$\sigma_L = \frac{pr}{2t}$$

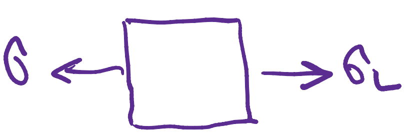


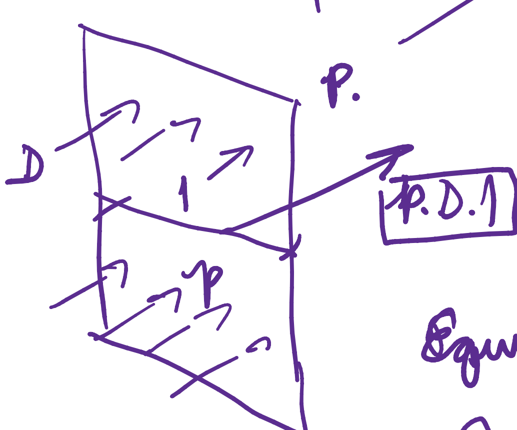


$$\frac{\sigma_L \cdot (t \cdot \pi D)}{} = \frac{p \cdot \pi D^2}{4}$$







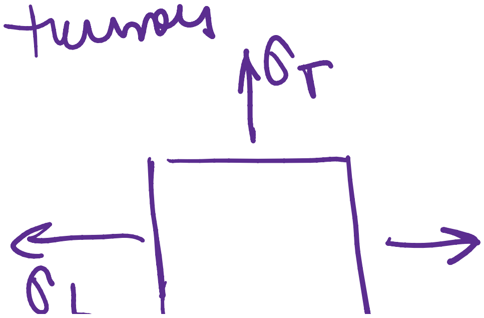


$\boxed{p.D.1}$

biaxial stress state

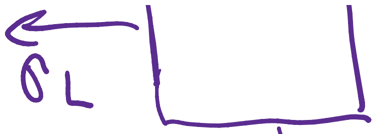
Equilibrium: $\sigma_T (t \times 1) \times 2 = p.D.1$

$$\sigma_T = \frac{p.D}{2t} = \frac{p.2r}{2t} = \frac{pr}{t}$$



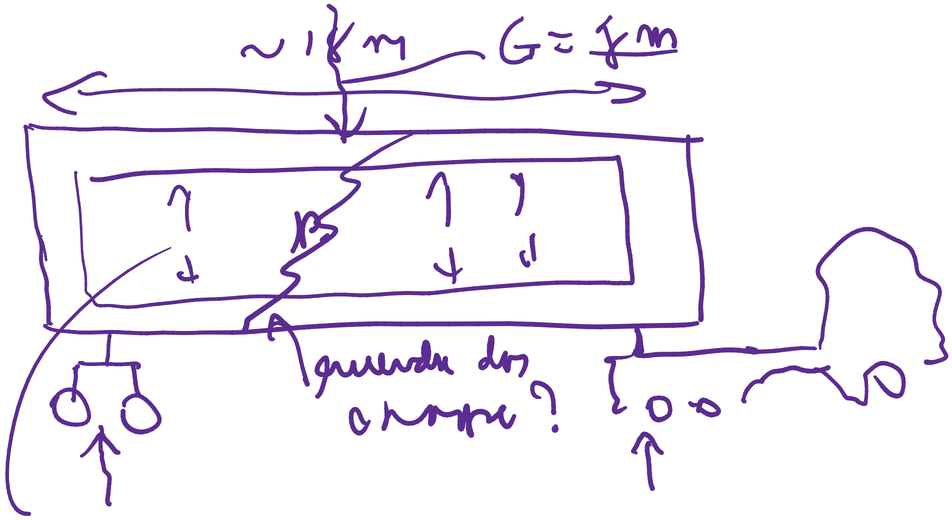
$$\sigma_L = \frac{p.D}{4t}$$

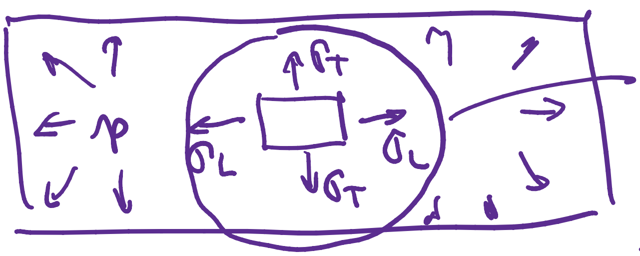
$$\boxed{\sigma_T = 2\sigma_L}$$



$$\sigma_L = \frac{p \cdot D}{4t} \qquad \boxed{\sigma_T = 2\sigma_L}$$

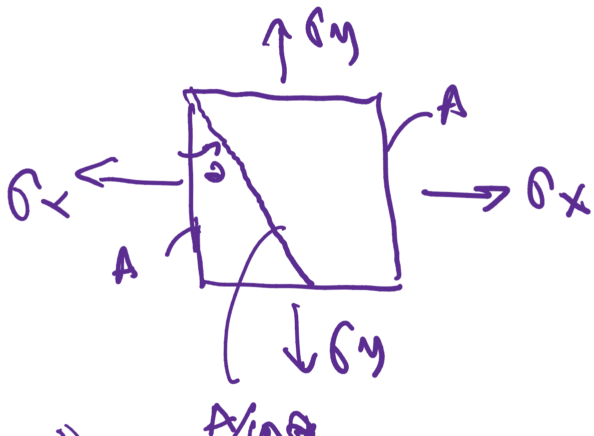
$$\sigma_T = \frac{pD}{2t}$$

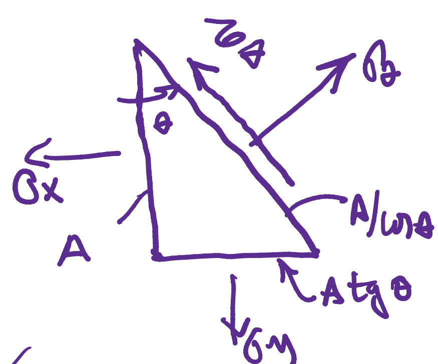




somente p/ análise das pressões internas

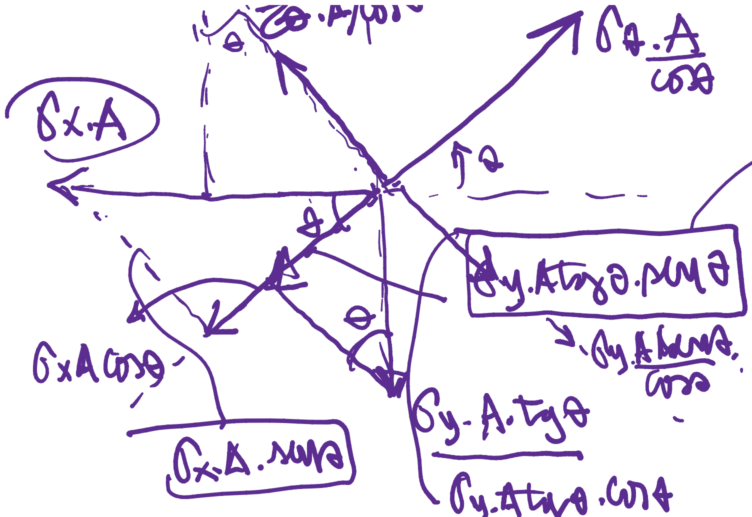
Elemento de tensões





$$\sigma_\theta \cdot \frac{A}{\cos\theta} - \sigma_x A\cos\theta - \sigma_y \cdot A\,tg\theta = 0$$

senθ



$$\sigma_\theta - \sigma_x \cos^2\theta - \sigma_y \cdot \frac{\sin\theta \cdot \sin\theta \cdot \cancel{\cos\theta}}{\cancel{\cos\theta}} = 0$$

$$\sigma_\theta = \sigma_x \cos^2\theta + \sigma_y \sin^2\theta$$

$$\boxed{\sigma_\theta = \sigma_x \cos^2\theta + \sigma_y \sin^2\theta}$$

$$\frac{\tau_\theta \cdot \cancel{A}}{\cos\theta} + \sigma_x \cancel{A} \sin\theta - \sigma_y \cancel{A} \operatorname{tg}\theta \cdot \cos\theta = 0$$

$$\tau_\theta / \cos\theta = -\sigma_x \sin\theta + \sigma_y \frac{\sin\theta}{\cancel{\cos\theta}} \cdot \cancel{\cos\theta}$$

$$\tau_\theta = -\sigma_x \sin\theta \cos\theta + \sigma_y \sin\theta \cos\theta$$

$$* \quad \boxed{\tau_\theta = -(\sigma_x - \sigma_y) \cdot \sin\theta \cdot \cos\theta} \quad *$$

$$\sin\theta \cdot \cos\theta = \frac{1}{2} \sin 2\theta$$

$$\sigma_\theta = \sigma_x \cos^2\theta + \sigma_y \sin^2\theta$$

$$\tau_\theta = -(\sigma_x - \sigma_y) \cdot \sin\theta \cdot \cos\theta$$

$$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$$

$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\sigma_\theta = \frac{\sigma_x}{2} \cdot (1 + \cos 2\theta) + \frac{\sigma_y}{2}(1 - \cos 2\theta)$$

$$\sigma_\theta = \frac{\sigma_x}{2} + \frac{\sigma_x \cos 2\theta}{2} + \frac{\sigma_y}{2} - \frac{\sigma_y}{2} \cos 2\theta$$

$$\boxed{\sigma_\theta = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cdot \cos 2\theta}$$

$$\tau_\theta = -\sigma_x \cdot \sin\theta \cos\theta + \sigma_y \sin\theta \cdot \cos\theta$$

$$\tau_\theta = -\frac{\sigma_x}{2} \sin 2\theta + \frac{\sigma_y}{2} \sin 2\theta$$

$$\tau_\theta = -(\sigma_x - \sigma_y) \cdot \sin 2\theta$$

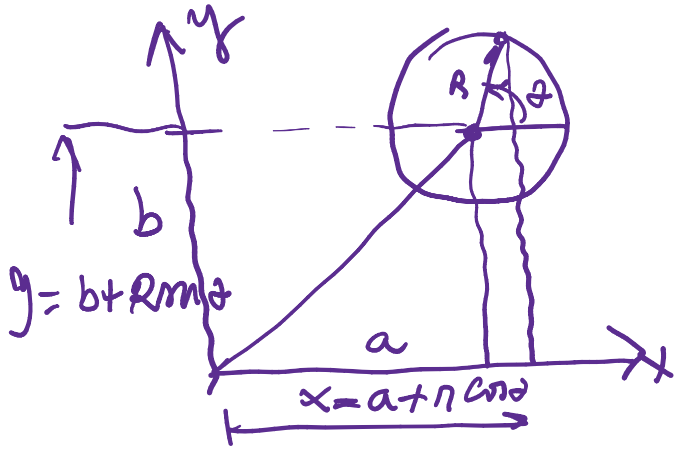
$\tau_\theta = -(\sigma_x - \sigma_y) \cdot \sin 2\theta$

com $\frac{\sigma_x + \sigma_y}{2} = \sigma_{média}$

$$\boxed{\sigma_\theta = \sigma_{med} + \frac{\sigma_x - \sigma_y}{2} \cdot \cos 2\theta}$$

* $\tau_\theta = -(\sigma_x - \sigma_y) \cdot \sin 2\theta$ *

Eq. paramétrica do círculo



$x = a + r\cos\theta$

$y = b + r \sin\theta$

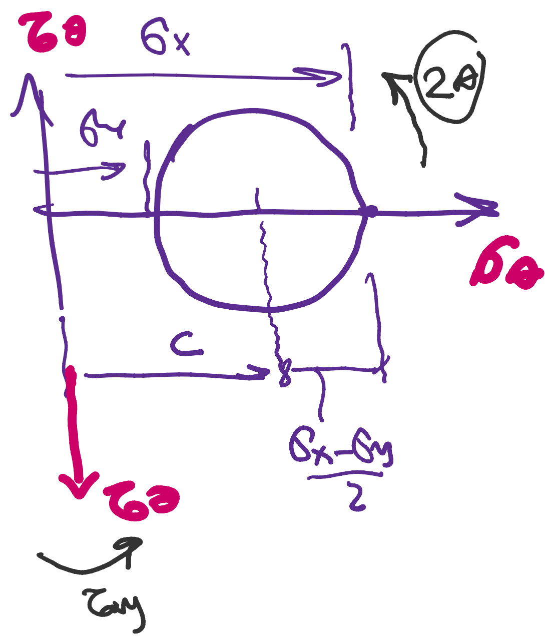
$x - a = r \cos\theta$

$y - b = r \sin\theta$

$(x-a)^2 + (y-b)^2 = r^2$

com $b = 0 \Rightarrow$ círculo centrado em x

$$\boxed{(x-a)^2 + y^2 = r^2}$$



$\sigma_\theta - \sigma_{med} = \frac{\sigma_x - \sigma_y}{2} \cos 2\theta$

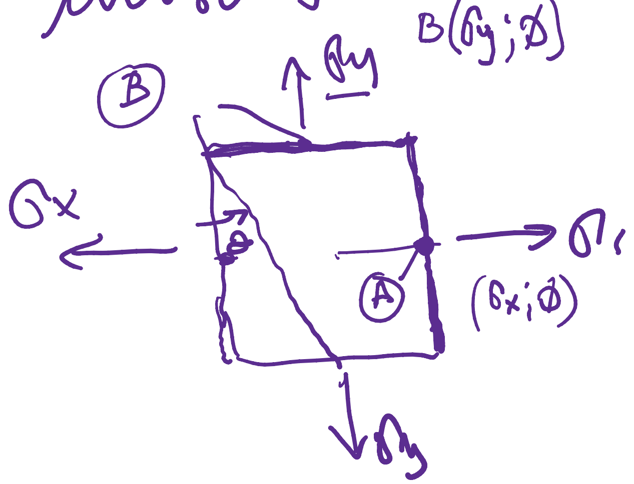
$\tau_\theta = -\left(\frac{\sigma_x - \sigma_y}{2}\right) \cdot \sin 2\theta$

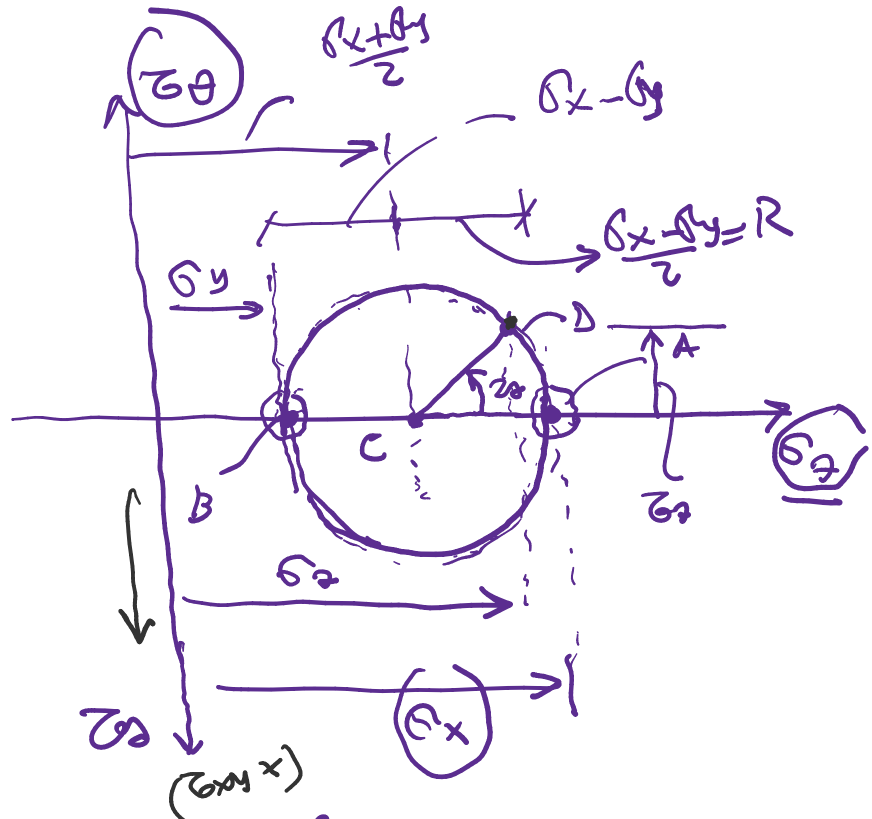
$$\boxed{(\sigma_\theta - \sigma_{med})^2 + \tau_\theta^2 = \left(\frac{\sigma_x - \sigma_y}{2}\right)^2}$$

Círculo de Mohr para análise de tensões

(τ_θ) $\frac{\sigma_x + \sigma_y}{2}$ $\sigma_x - \sigma_y$

tumois



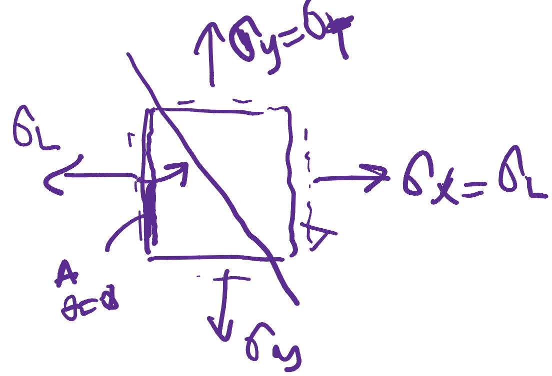


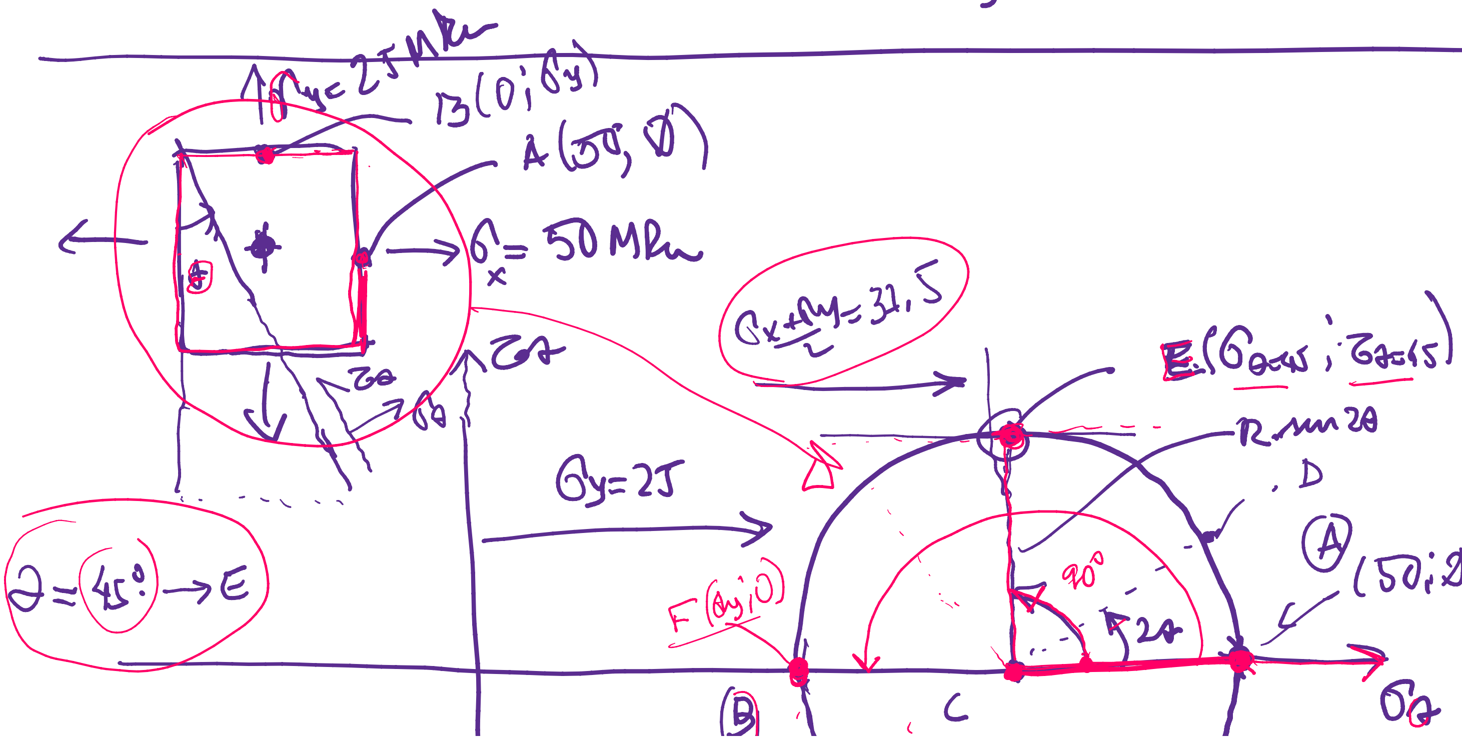
$$\sigma_\theta = C + R\cos 2\theta$$

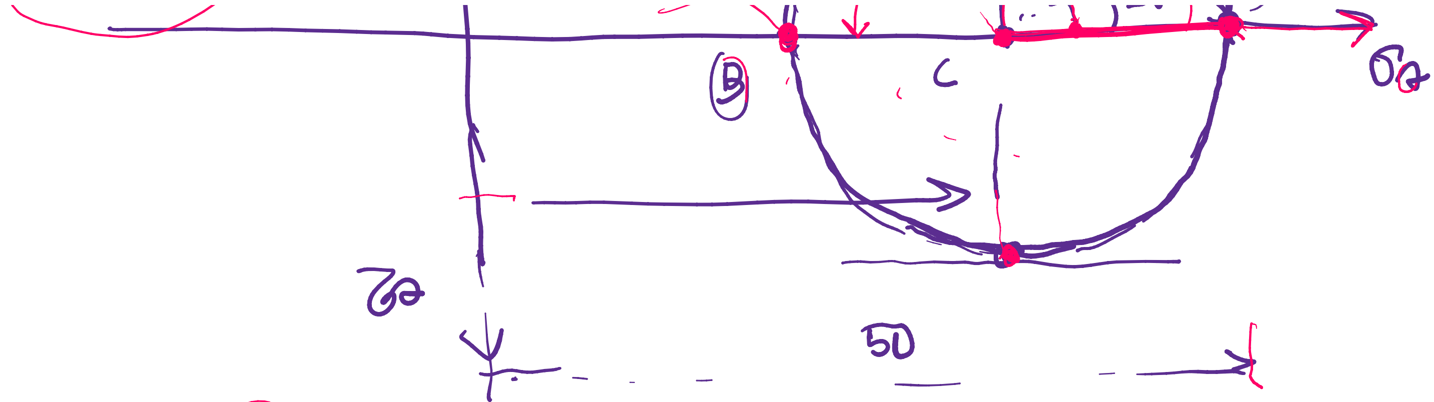
$$\boxed{\sigma_\theta = \frac{\sigma_x+\sigma_y}{2} + \frac{\sigma_x-\sigma_y}{2}\cos 2\theta}$$

$$\tau_\theta = R.\sin 2\theta = \frac{\sigma_x-\sigma_y}{2}.\sin 2\theta$$

$$\boxed{\tau_\theta = \frac{\sigma_x-\sigma_y}{2}.\sin\theta}$$

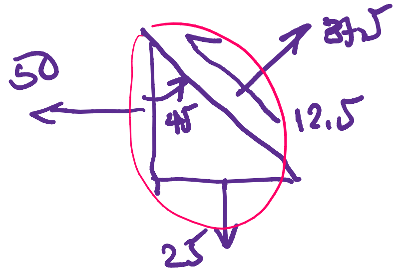




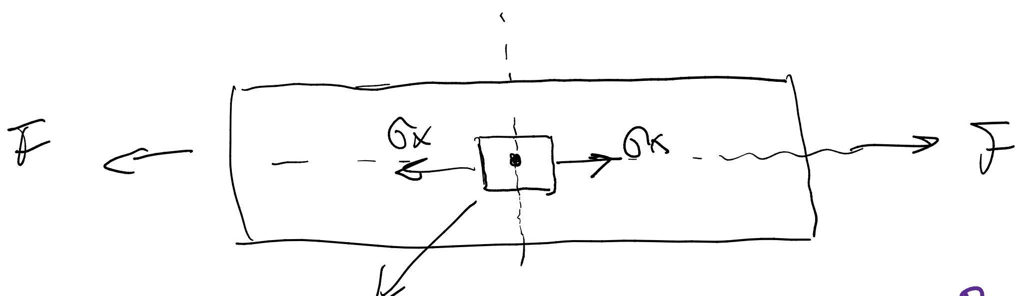


$$\sigma(\theta=45) = \frac{\sigma_x+\sigma_y}{2} = 37{,}5\ \mathrm{MN/m}$$

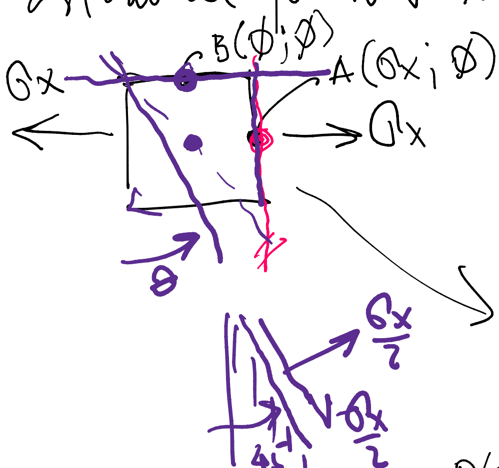
$$\tau(\theta=45) = \left(\frac{\sigma_x-\sigma_y}{2}\right) = \frac{50-25}{2} = 12{,}5$$



Exp

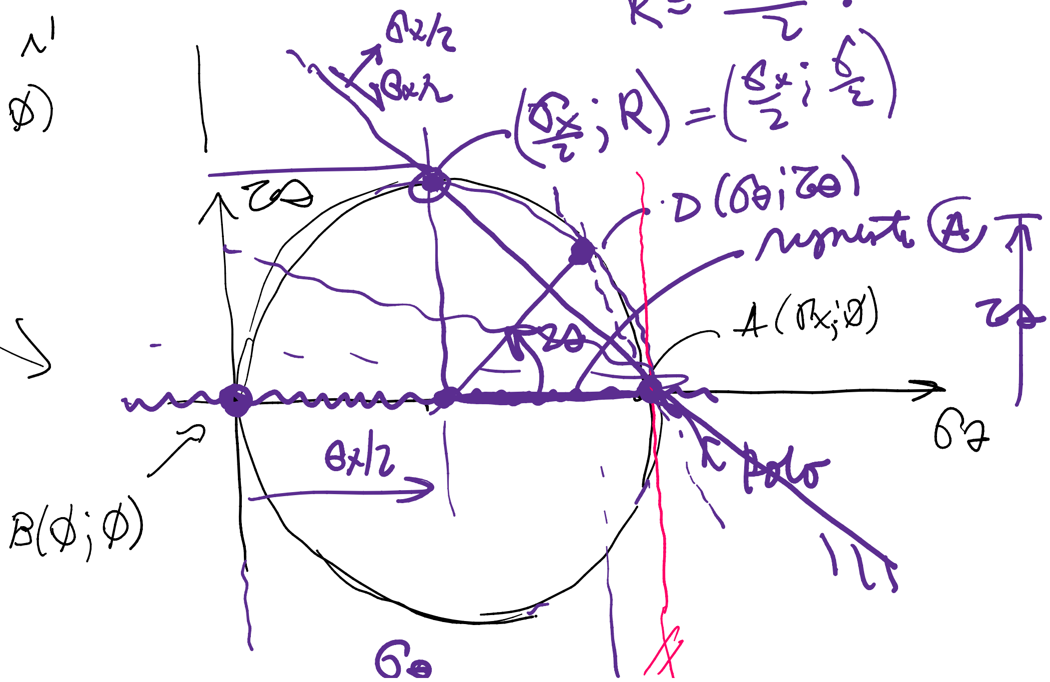


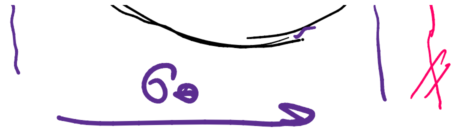
Estado de tensões n'



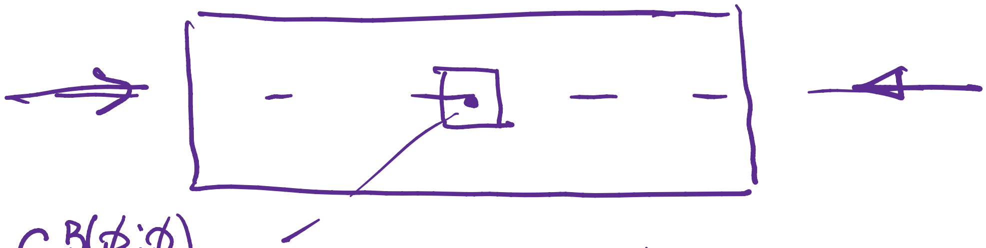
$$R = \frac{\sigma_x-\sigma_y}{2}$$

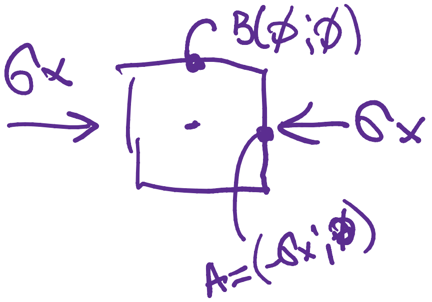
$$\left(\frac{\sigma_x}{2}; R\right) = \left(\frac{\sigma_x}{2}; \frac{\sigma_x}{2}\right)$$

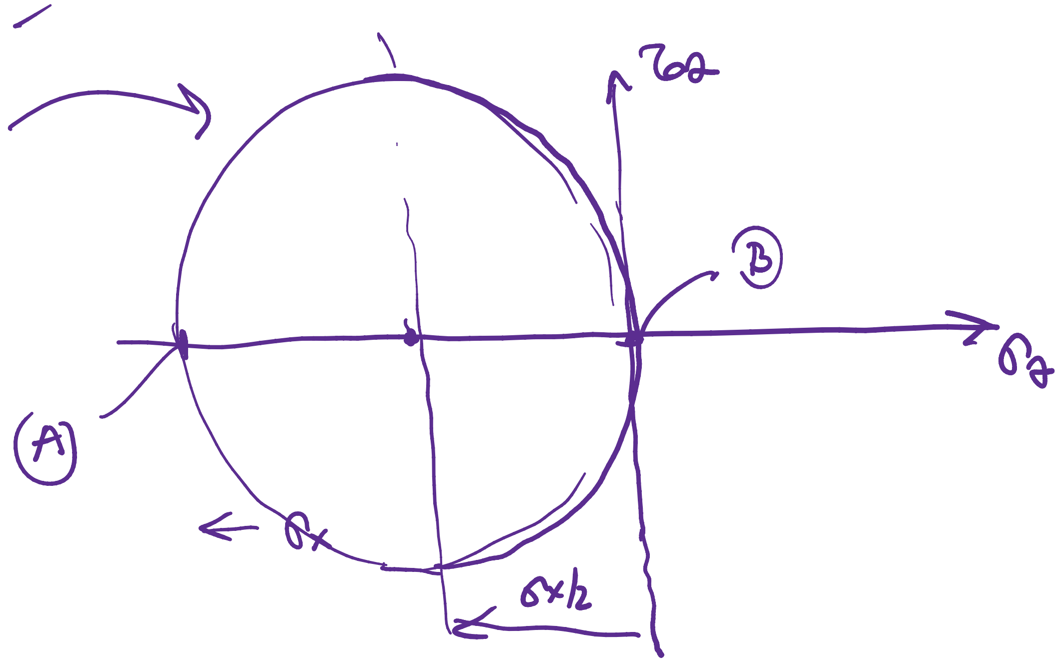




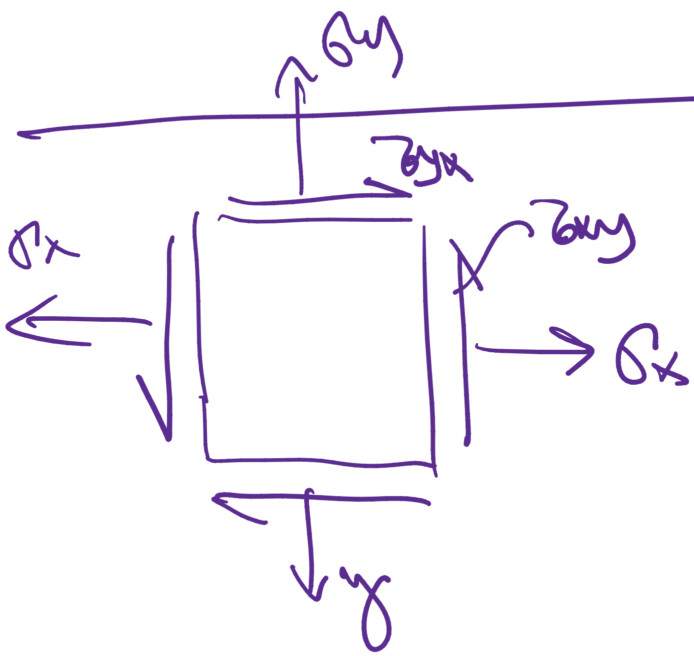
compresión

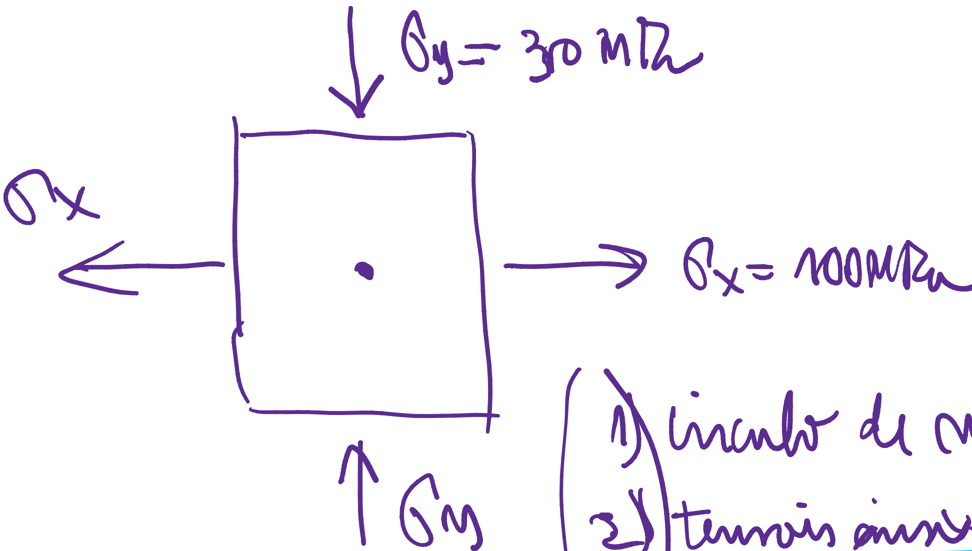






Estado plano de tensión





1) circulo de mohr
2) tensões ~~máximas~~ mínimas de cisalhamento
3) tensões para θ = 25° !!

Entrega
2ª 8/6 às 7h30 !!!