<u>Mohr's Circle</u>

- Graphical representation of the stress equations

$$\sigma_{x_1} = \frac{\sigma_x+\sigma_y}{2} + \frac{\sigma_x-\sigma_y}{2}\cos 2\theta + \tau_{xy}\sin 2\theta$$

$$\tau_{x_1y_1} = -\left(\frac{\sigma_x-\sigma_y}{2}\right)\sin 2\theta + \tau_{xy}\cos 2\theta$$

Square both sides of each equation, and add

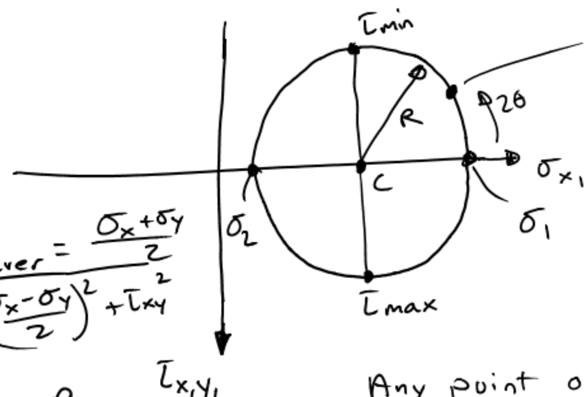
ASM

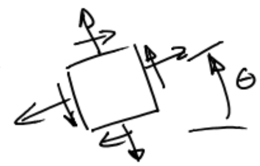
$$\left[\sigma_{x_1} - \left(\frac{\sigma_x+\sigma_y}{2}\right)\right]^2 + \tau_{x_1y_1}^2 = \left(\frac{\sigma_x-\sigma_y}{2}\right)^2 + \tau_{xy}^2$$

Let $\sigma_{aver} = \dfrac{\sigma_x+\sigma_y}{2}$, $R = \sqrt{\left(\dfrac{\sigma_x-\sigma_y}{2}\right)^2 + \tau_{xy}^2}$

$$\boxed{(\sigma_{x_1} - \sigma_{aver})^2 + \tau_{x_1y_1}^2 = R^2}$$

Equation of a Circle





$$C = \sigma_{aver} = \frac{\sigma_x+\sigma_y}{2}$$

$$R = \sqrt{\left(\frac{\sigma_x-\sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

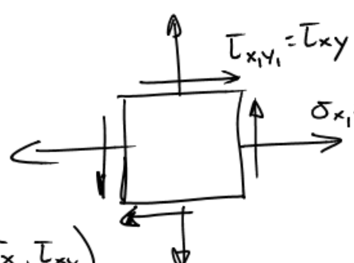
$\sigma_1 = C + R$

$\sigma_2 = C - R$

$\tau_{max} = R$

Any point on the circle represents the stresses at an angle

$\theta = 0°$



$\sigma_{x_1} = \sigma_x$

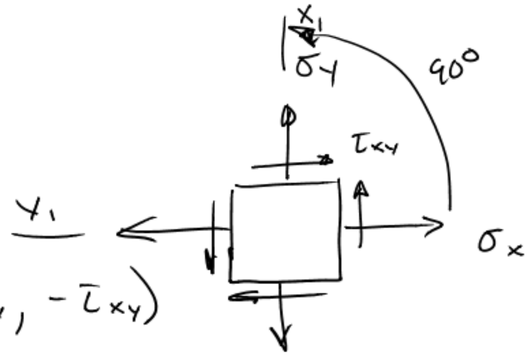
$\tau_{x_1y_1} = \tau_{xy}$

$\theta = 0°$ (Point A) $= (\sigma_x, \tau_{xy})$

$\underline{\theta = 90^\circ}$

$\sigma_{x_1} = \sigma_y$

$\tau_{x_1 y_1} = -\tau_{xy}$



$\theta = 90^\circ$ (Point B) $= (\sigma_y, -\tau_{xy})$