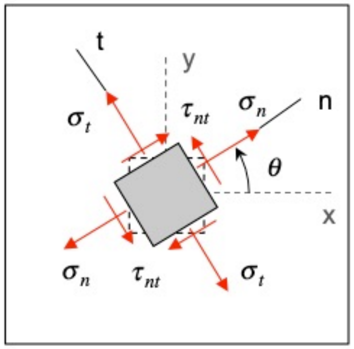
Summary: Mohr's circle

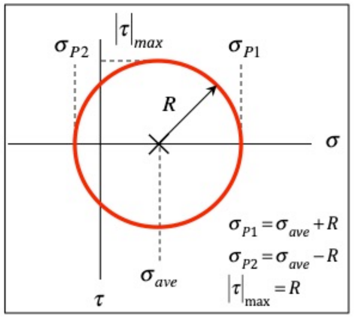
OBSERVATION: Consider the stress transformation derived earlier:



$$\sigma_n(\theta) = \frac{\sigma_x + \sigma_y}{2} + \left(\frac{\sigma_x - \sigma_y}{2}\right) cos2\theta + \tau_{xy} sin2\theta$$

$$\tau_{nt}(\theta) = -\left(\frac{\sigma_x - \sigma_y}{2}\right) sin2\theta + \tau_{xy} cos2\theta$$

When plotted in the (σ, τ)-plane, this set of equations represents a circle of radius R and centered at point $(\sigma, \tau) = (\sigma_{ave}, 0)$ where:



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

COMMENTS:

- In order to maintain consistency in directions of rotation, the τ-axis is typically drawn *downwardly-positive*.
- The values of σ_{P1}, σ_{P2} and $|\tau|_{max}$ are readily observed from Mohr's circle.
- By locating the *x*-axis in Mohr's plane, $(\sigma, \tau) = (\sigma_x \; \tau_{xy})$, we can tie rotations in the physical plane to rotations in Mohr's plane.
- A rotation of θ in the physical plane corresponds to a rotation of 2θ in Mohr's plane. This is seen in the above stress transformation equations.