

### Problem 3

Determine:— Principal Stresses  
— Max Shear Stress

### Mohr's Circle

$$\sigma_x = 8300 \text{ psi}, \sigma_y = -19,700 \text{ psi}, \tau_{xy} = -4800 \text{ psi}$$

$$C = \frac{\sigma_x + \sigma_y}{2} = \frac{8300 + (-19,700)}{2} = -5700 \text{ psi}$$

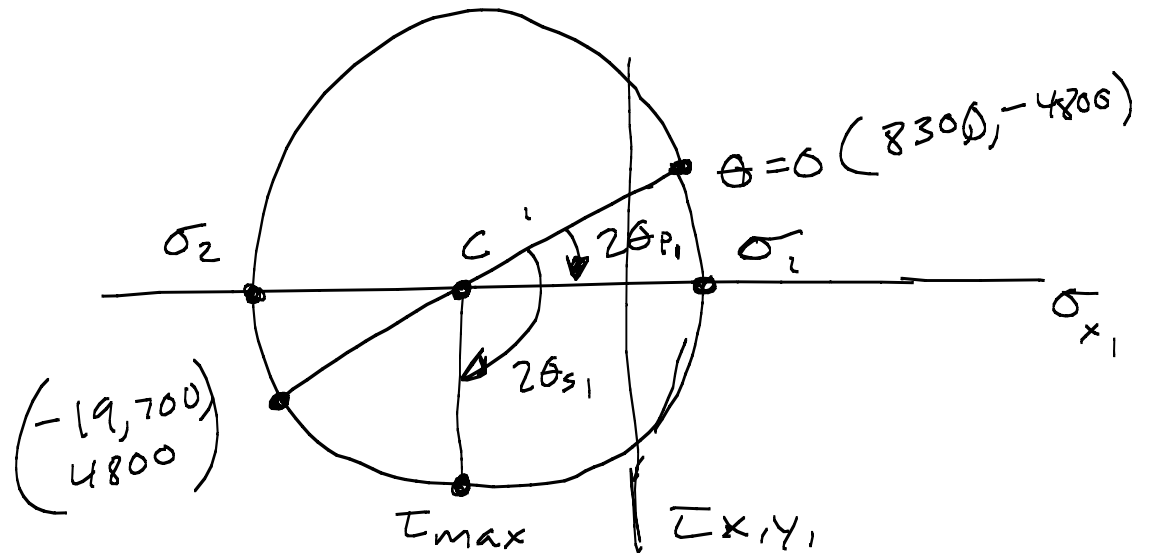
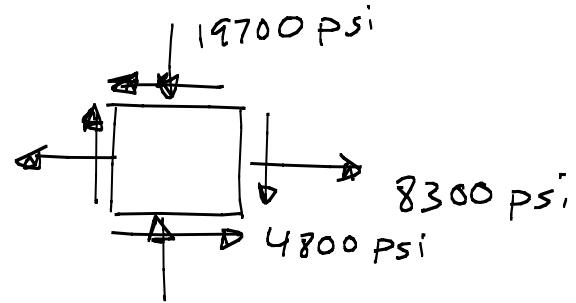
$$R = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + (\tau_{xy})^2} = \sqrt{\left(\frac{8300 - (-19,700)}{2}\right)^2 + (-4800)^2}$$

$$R = 14,800$$

$$A(\sigma_x, \tau_{xy}) = (8300, -4800)$$

$$B(\sigma_y, -\tau_{xy}) = (-19,700, 4800)$$

$$\begin{aligned}\sigma_1 &= C + R \\ &= -5700 + 14,800\end{aligned}$$



$$\sigma_1 = 9100 \text{ psi}$$

$$\sigma_2 = C - R = -5700 - 14,800 = -20,500 \text{ psi}$$

$$\tau_{\max} = R = 14,800 \text{ psi}$$

$$\tan 2\theta_{p_1} = \frac{4800}{14000}$$

$$\theta_{p_1} = 9.46^\circ \text{ (CW)}$$

$$2\theta_{s_1} = 2\theta_{p_1} + 90^\circ$$

$$\theta_{s_1} = \theta_{p_1} + 45^\circ$$

$$\boxed{\theta_{s_1} = 54.46^\circ}$$

