

8.4-1

$$\uparrow -5000 \text{ psi} = \sigma_y$$

$$\left[ \begin{array}{c} \uparrow \\ \downarrow \end{array} \right] \left[ \begin{array}{c} \leftarrow \\ \rightarrow \end{array} \right] \begin{array}{c} 3000 \text{ psi} = \sigma_x \\ -3000 \text{ psi} = \tau_{xy} \end{array}$$

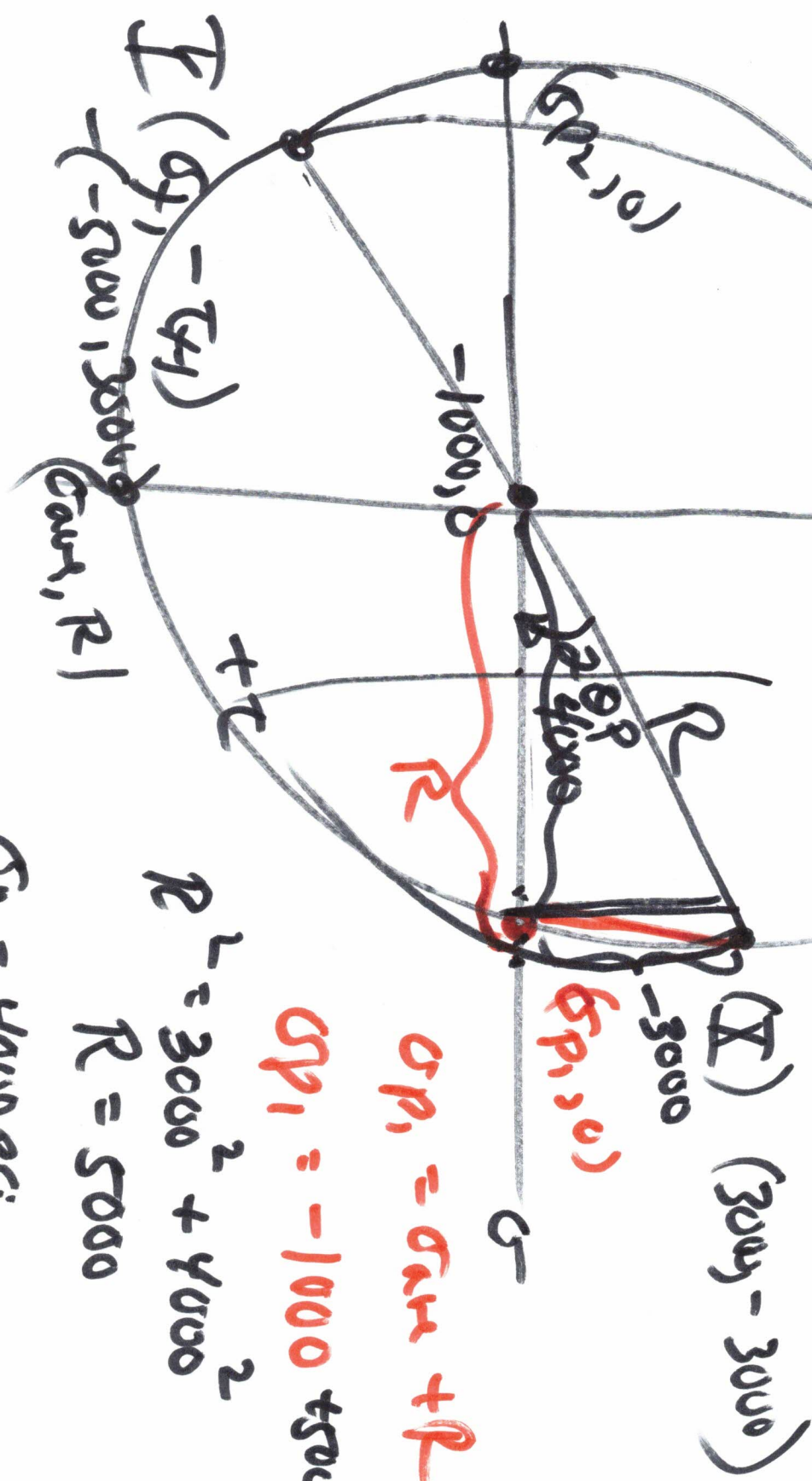
$$C: (\sigma_{ave}, 0) \\ = (-1000, 0)$$

$$\sigma_{ave} = \frac{\sigma_x + \sigma_y}{2} = \frac{3000 + (-5000)}{2}$$

$$X: (\sigma_x, \tau_{xy}) = (3000, -3000)$$

$$Y: (\sigma_y, -\tau_{xy}) = (-5000, +3000)$$





$\tau_{max} = R = 5000 \text{ psi}$   
 in-plane

$\sigma_{p1} = -1000 + 5000 = 4000 \text{ psi}$

$\sigma_{p2} = \sigma_{avg} - R$

$R^2 = 3000^2 + 4000^2$

$R = 5000$

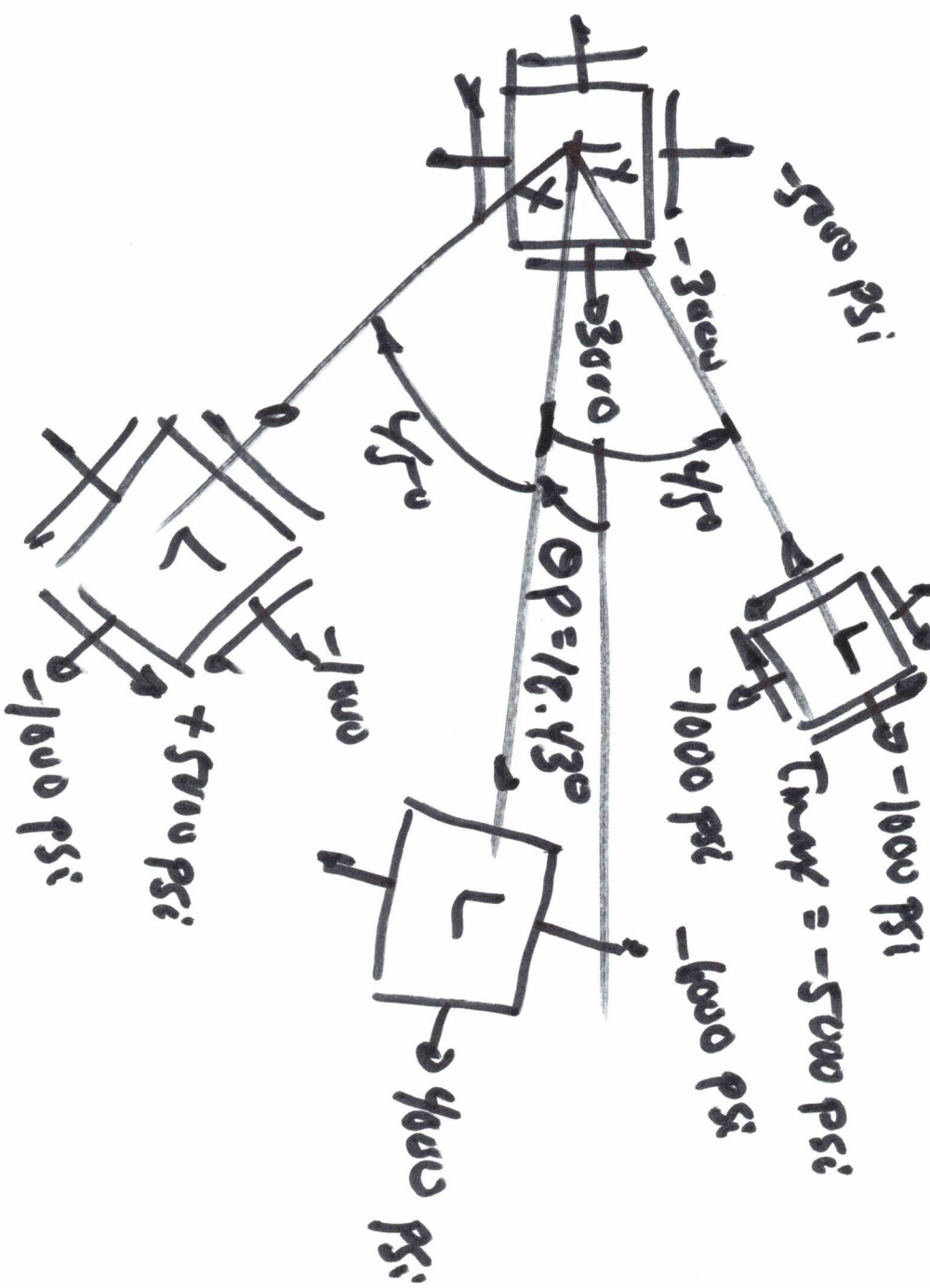
$\sigma_{p1} = 4000 \text{ psi}$

$\sigma_{p2} = -1000 - 5000 = -6000 \text{ psi}$

$\tan 2\theta_P = \frac{3000}{4000}$

$2\theta_P = 36.87^\circ$

$\theta_P = 18.43^\circ$



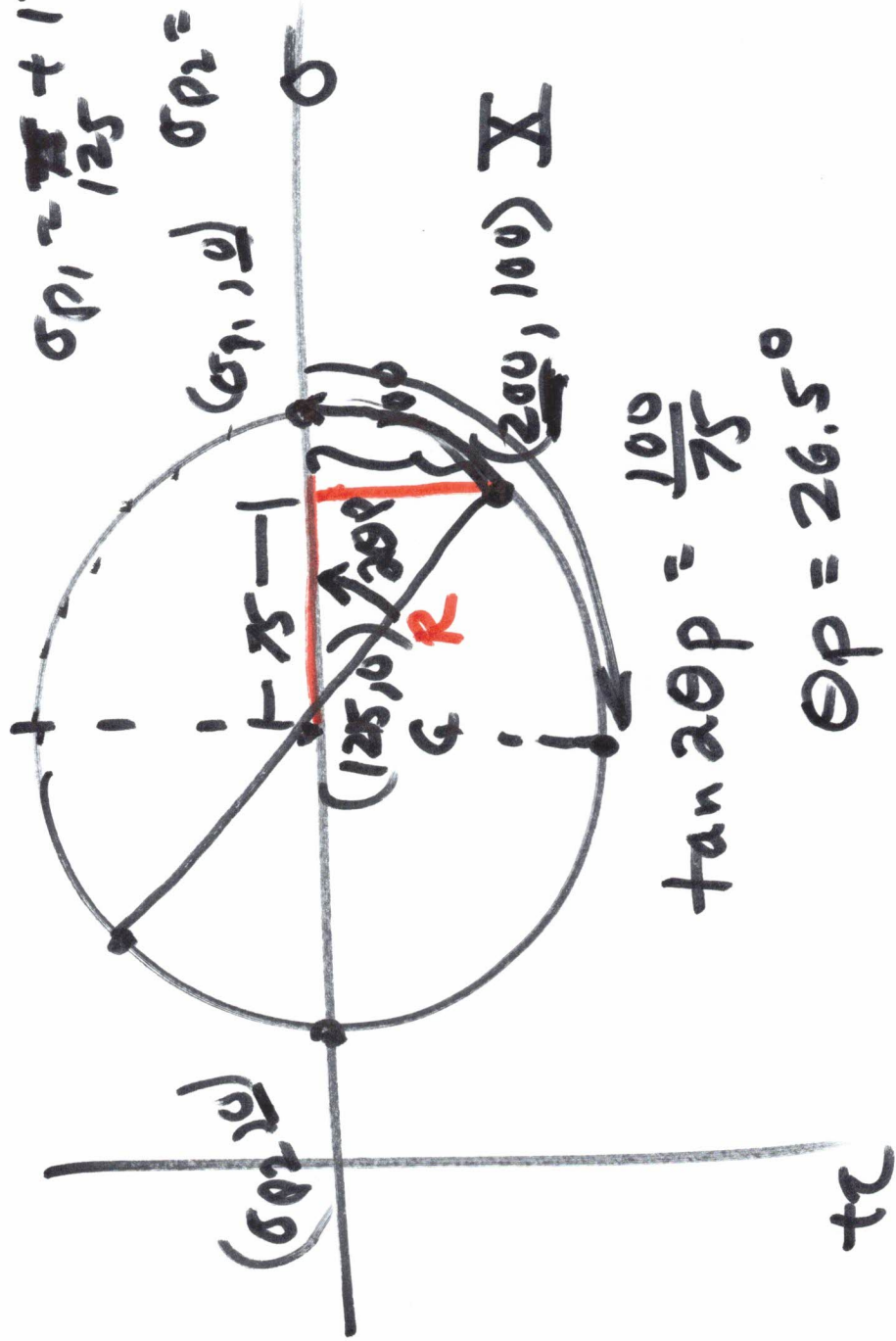
$$R^2 = 100^2 + 75^2$$

$$R = 125$$

$$\sigma_{p1} = \frac{250}{125} + 125 = 250 \text{ MPa}$$

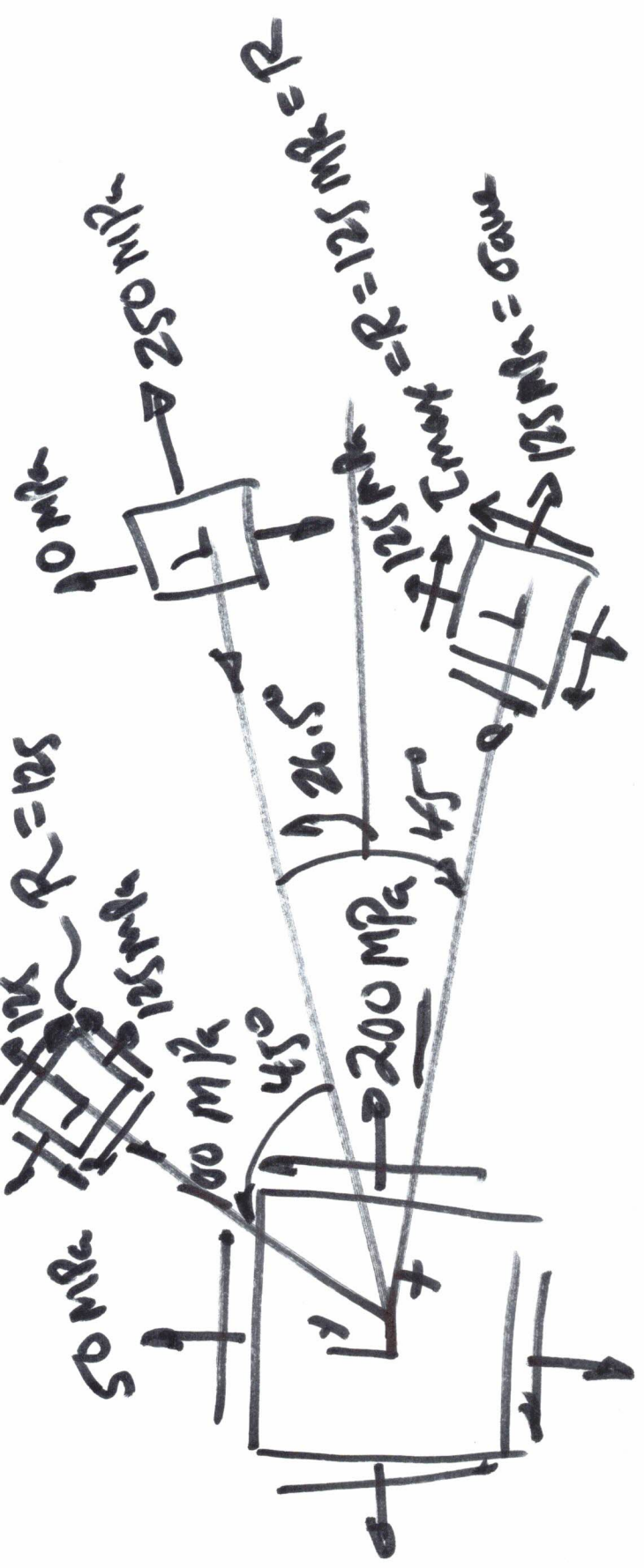
$$\sigma_{p2} = 125 - 125 = 0$$

$$F(50, -100)$$



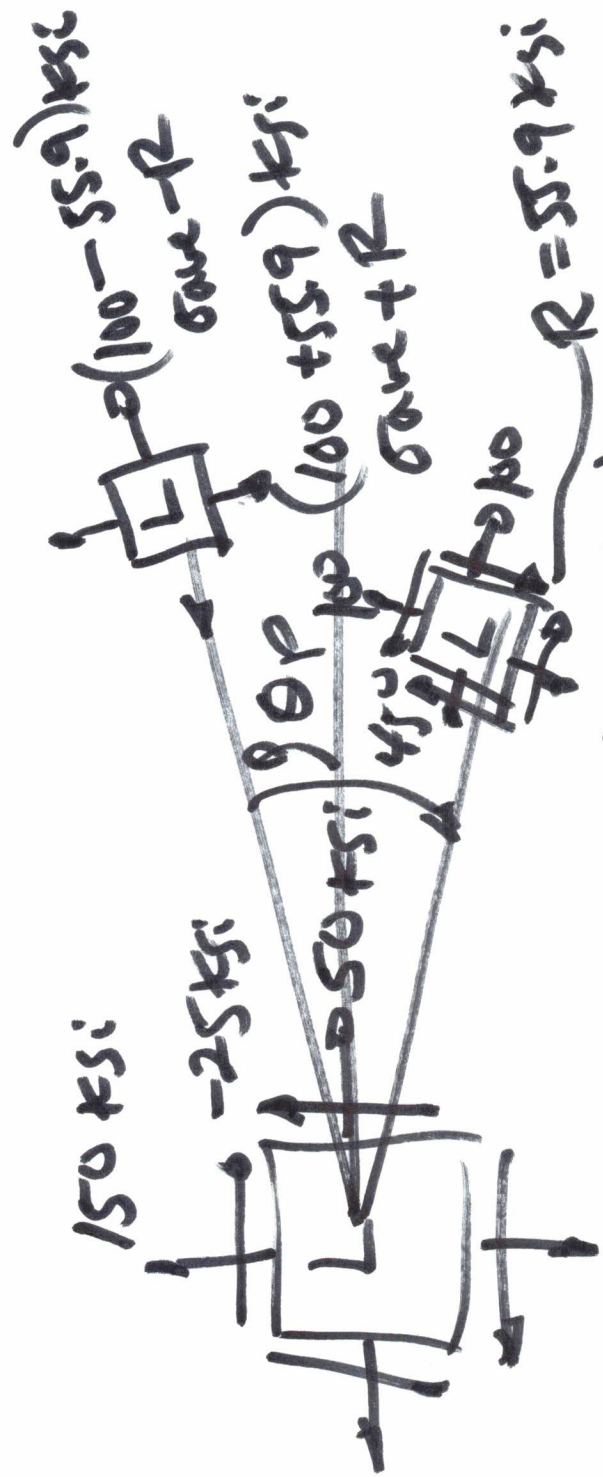
$$\tan 2\theta_p = \frac{100}{75}$$

$$\theta_p = 26.5^\circ$$



- X :  $(50, 125) = (200, 100)$
- Y :  $(100, 200) = (50, -100)$
- Z :  $(250, 125) = (125, 60)$





$$I : (x_1, x_2) = (25, -25)$$

$$I : (y_1, y_2) = (150, +25)$$

$$C : (x_1, x_2) = (100, 0)$$

$$R^2 = 50^2 + 25^2$$

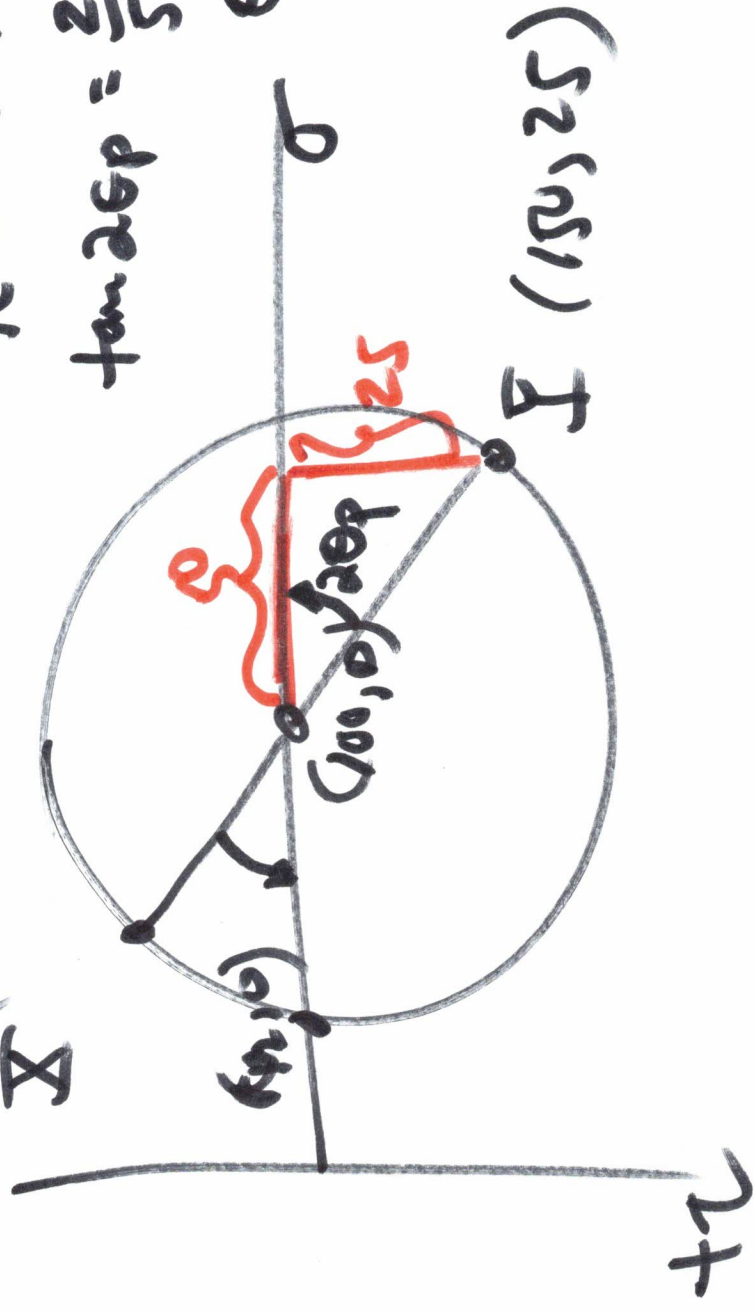
$$R = 55.9 \text{ ksi}$$

$$\tan 2\theta_p = \frac{25}{50}$$

$$\theta_p = 13.28^\circ$$

$(50, -25)$

$\sigma$



$Y (150, 25)$