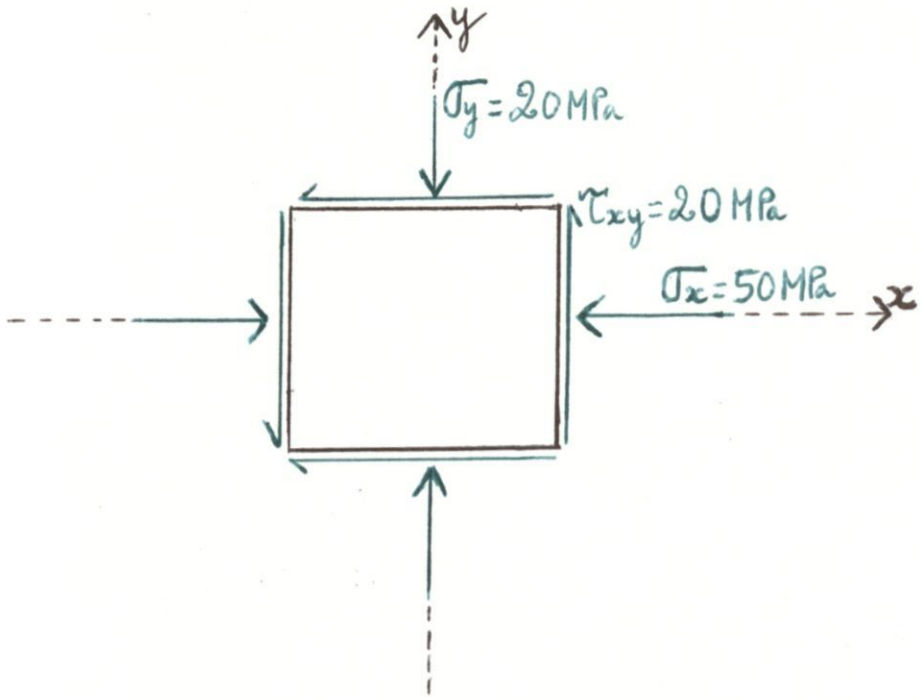
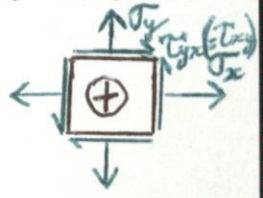
DTY Tutoring, inc.
Email: dtytutoring@gmail.com
Website:www.dtytutoring.com

Date: 7th January 2019



Positive sign convention



$\sigma_y = -20\,MPa$

$\sigma_x = -50\,MPa$

$\tau_{xy} = 20\,MPa$

$$\sigma_{avg} = \frac{\sigma_x + \sigma_y}{2} = \frac{[(-50) + (-20)]\,MPa}{2} = -35\,MPa \;;\; C(\sigma_{avg}, 0) \Rightarrow C(-35MPa, 0)$$

$$\tau_{MAX} = R = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + (\tau_{xy})^2} = \sqrt{\left[\frac{(-50) - (-20)}{2}\right]^2 + (20)^2} = 25\,MPa$$

$$\sigma_1 = \sigma_{avg} + R = (-35\,MPa) + (25\,MPa) = -10\,MPa$$

$$\sigma_2 = \sigma_{avg} - R = (-35\,MPa) - (25\,MPa) = -60\,MPa$$

$$X(\sigma_x, \tau_{xy}) \Rightarrow X(-50\,MPa, 20\,MPa)$$

$$Y(\sigma_y, -\tau_{xy}) \Rightarrow Y(-20\,MPa, -20\,MPa)$$

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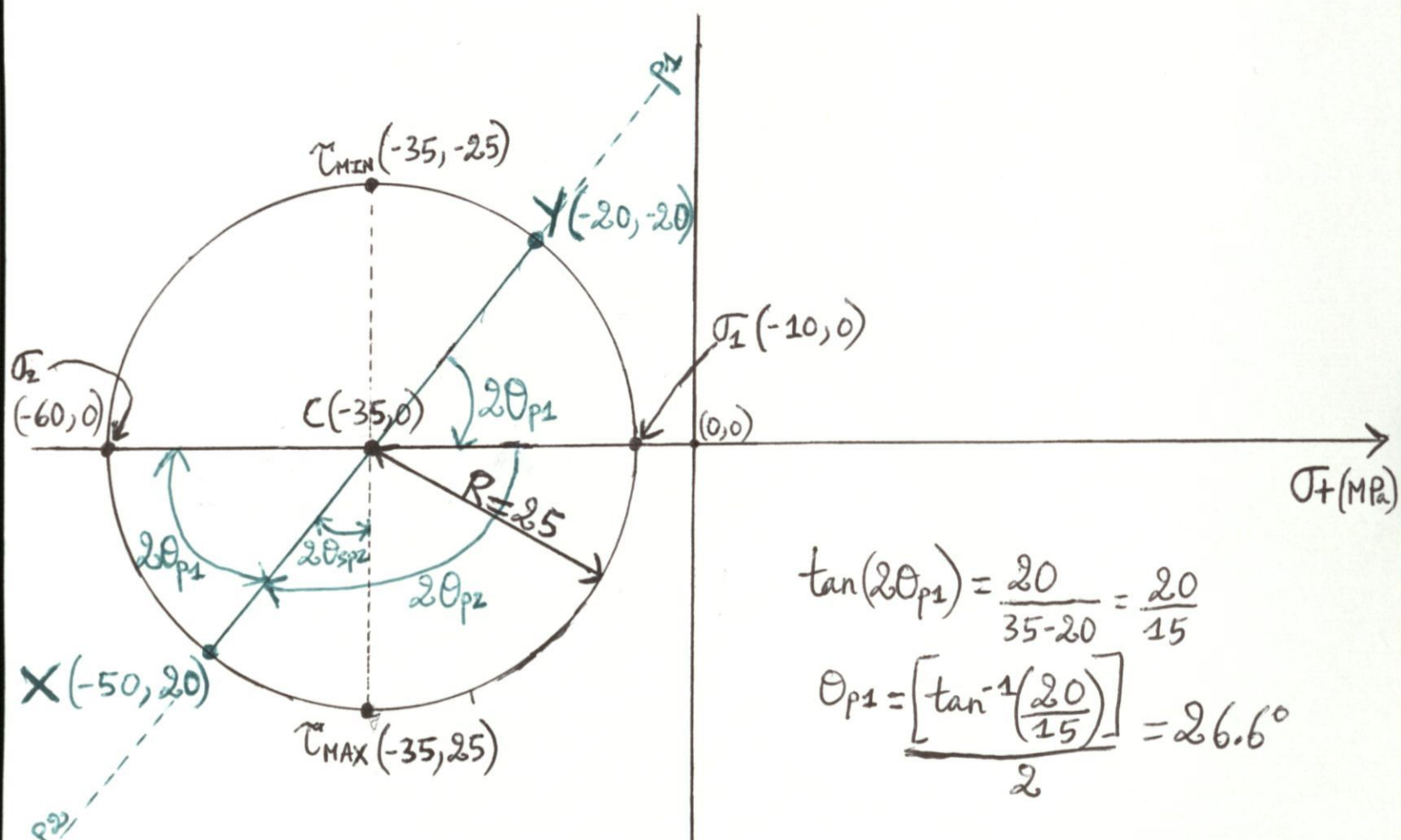
Mohr's Circle



$$\tan(2\theta_{p1}) = \frac{20}{35-20} = \frac{20}{15}$$

$$\theta_{p1} = \frac{\left[\tan^{-1}\left(\frac{20}{15}\right)\right]}{2} = 26.6°$$

$$2\theta_{sp2} = 90° - 2\theta_{p1} = 90 - 2(26.6) = 36.87°$$

$$2\theta_{p2} = (90°) + 2\theta_{sp2} = 90° + 36.87° = 126.87°$$

$$\theta_{p2} = \frac{126.87°}{2} = 63.4°$$