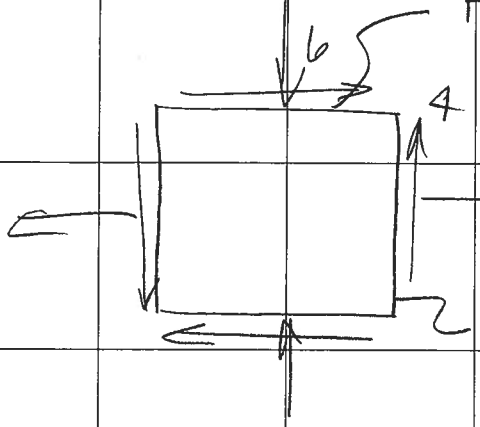
Calculate the principal stresses and the maximum and minimum shearing stresses for the state of Plane Stress shown. Show these stresses properly oriented sketches. Use Mohr's Circle



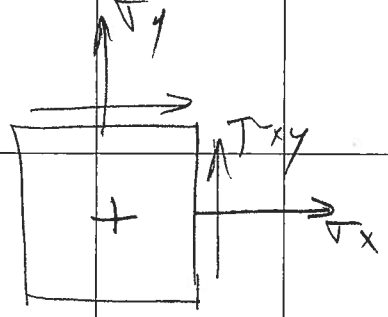
plane 2 (-6, 4)

This is positive because it would rotate element CW

(3, -4)

This is negative for the Mohr's circle because it would rotate the element CCW

Determine the proper signs of σ_x, σ_y, and τ_{xy}



$\sigma_x = 3$

$\sigma_y = -6$

$\tau_{xy} = 4$

Determine the center of the circle

(1) $\sigma_{center} = \dfrac{\sigma_x + \sigma_y}{2}$

(2) $\sigma_{center} = \dfrac{3 + (-6)}{2} = -1.5$

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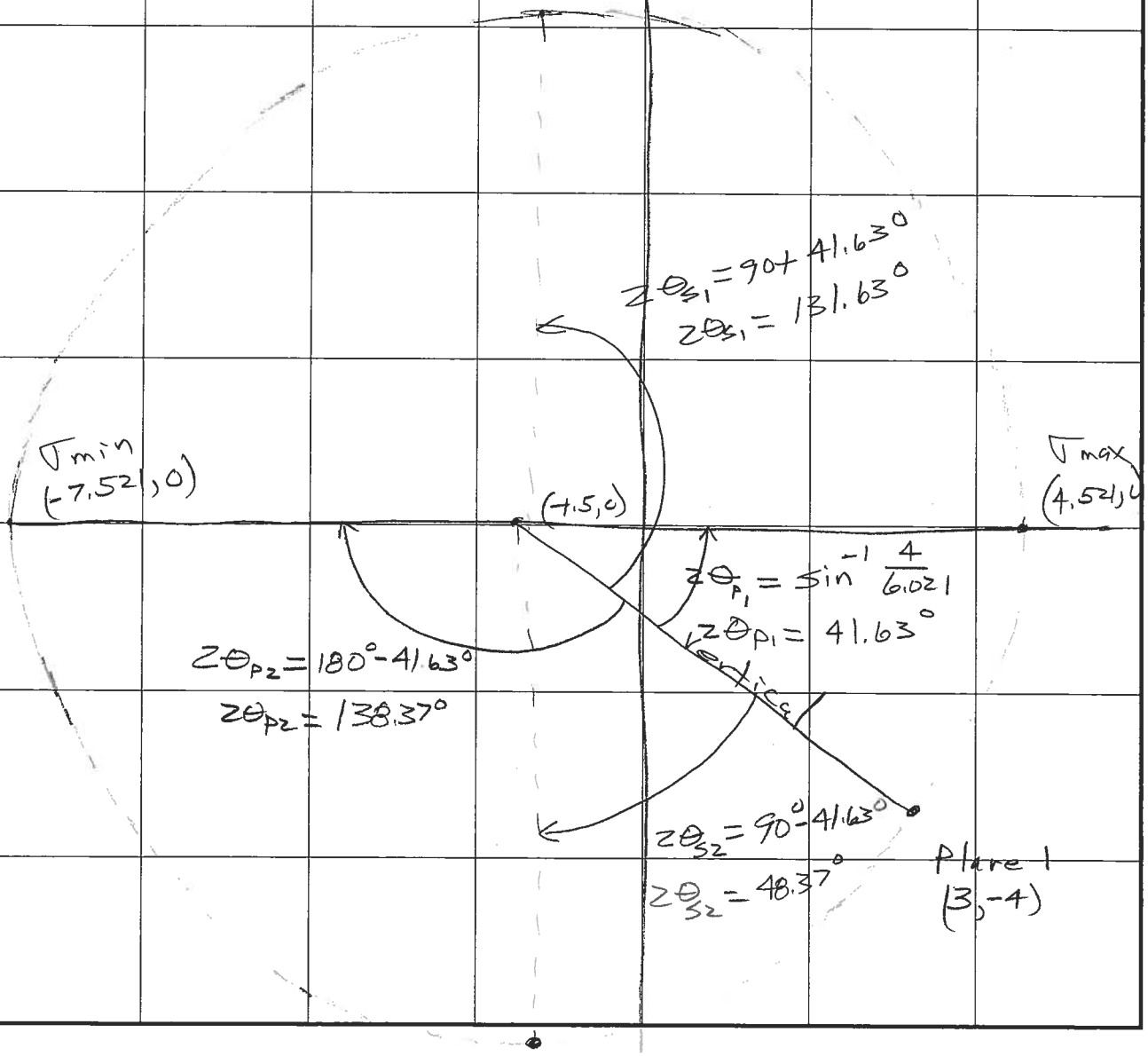
Determine the radius of the circle

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

(4) $R = \sqrt{\left(\frac{3-(-6)}{2}\right)^2 + (4)^2}$

(5) $R = 6.021$ $\quad \tau_{max}$ $(-1.5, 6.021)$



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$(-1.5, -6.021)$

As shown on the circle

(6) $\tau_{max} = 4.521$ $2\theta_{p_1} = 41.63^\circ$ CCW

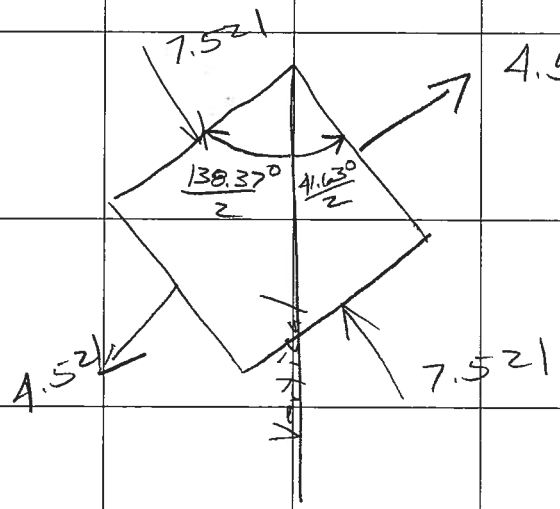
(7) $\tau_{min} = -7.521$ $2\theta_{p_2} = 138.37^\circ$ CW

(8) $\uparrow\tau_{max} = +6.021$ $2\theta_{s_1} = 131.63^\circ$ CCW

(9) $\uparrow\tau_{min} = -6.021$ $2\theta_{s_2} = 48.37^\circ$ CW

(10) $\tau_{center} = -1.5$

Show the principal stresses on a properly oriented sketch



Maximum and Minimum Normal Stresses or Principal Stresses

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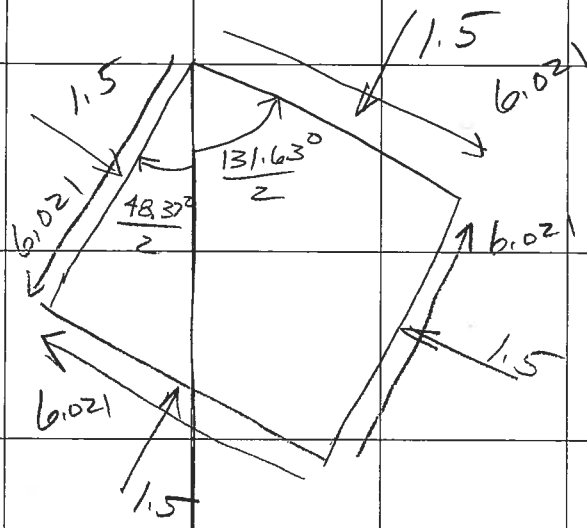
Show the maximum and minimum shearing stresses on a properly oriented sketch.



Maximum and Minimum Shearing Stresses

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