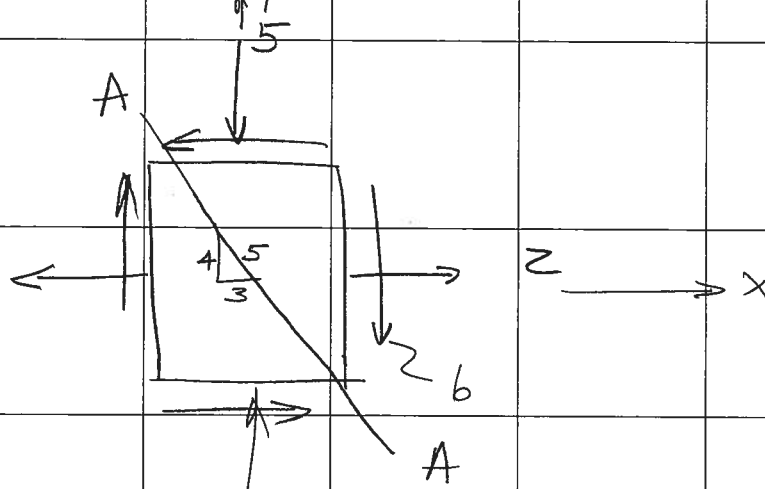
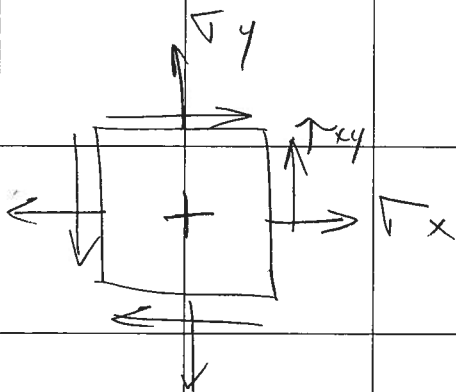


Determine the normal and shearing stresses acting on plane A-A of the point shown



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

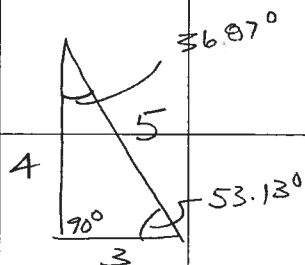


$$\sigma_x = 2$$

$$\sigma_y = -5$$

$$\tau_{xy} = -6$$

Determine the proper angle to be used in the stress transformation equations



Since θ is measured counter clockwise from a vertical plane

$$\theta = +36.87^\circ$$

Next Calculate $\sigma_{36.87^\circ}$ using stress transformation equations

$$(1) \quad \sigma_\theta = \sigma_x \cos^2 \theta + \sigma_y \sin^2 \theta + 2\tau_{xy} \sin \theta \cos \theta$$

$$(2) \quad \sigma_{36.87} = 2 \cos^2 36.87^\circ - 5 \sin^2 36.87^\circ + 2(-6) \sin 36.87^\circ \cos 36.87^\circ$$

$$(3) \quad \sigma_{36.87} = 1,280 - 1,800 - 5,760$$

$$(4) \quad \underline{\sigma_{36.87} = -6,280}$$

$$(5) \quad \sigma_\theta = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cos 2\theta + \tau_{xy} \sin 2\theta$$

$$(6) \quad \sigma_{36.87} = \frac{2-5}{2} + \frac{2-(-5)}{2} \cos 73.74^\circ + (-6) \sin 73.74^\circ$$

$$(7) \quad \sigma_{36.87} = -1.5 + .980 - 5.760$$

$$(8) \quad \underline{\sigma_{36.87} = -6.280}$$

Next calculate $\tau_{36.87^\circ}$ using stress transformation equations

$$(9) \quad \tau_\theta = -(\sigma_x - \sigma_y) \sin \theta \cos \theta + \tau_{xy} (\cos^2 \theta - \sin^2 \theta)$$

$$(10) \quad \tau_{36.87} = - (2 - (-5)) \sin 36.87 \cos 36.87 + (-6) (\cos^2 36.87 - \sin^2 36.87)$$

$$(11) \quad \tau_{36.87} = -3.360 - 1.680$$

$$(12) \quad \underline{\tau_{36.87} = -5.040}$$

or

$$(13) \quad \tau_{\theta} = - \left(\frac{\tau_x - \tau_y}{2} \right) \sin 2\theta + \tau_{xy} \cos 2\theta$$

$$(14) \quad \tau_{36.87} = - \left(\frac{2 - (-5)}{2} \right) \sin 73.74^\circ + (-6) \cos 73.74^\circ$$

$$(15) \quad \tau_{36.87} = -3.360 - 1.680$$

$$(16) \quad \underline{\tau_{36.87} = -5.040}$$

Finally, show the results on properly oriented sketches

