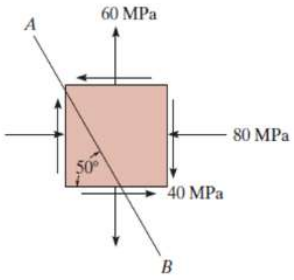
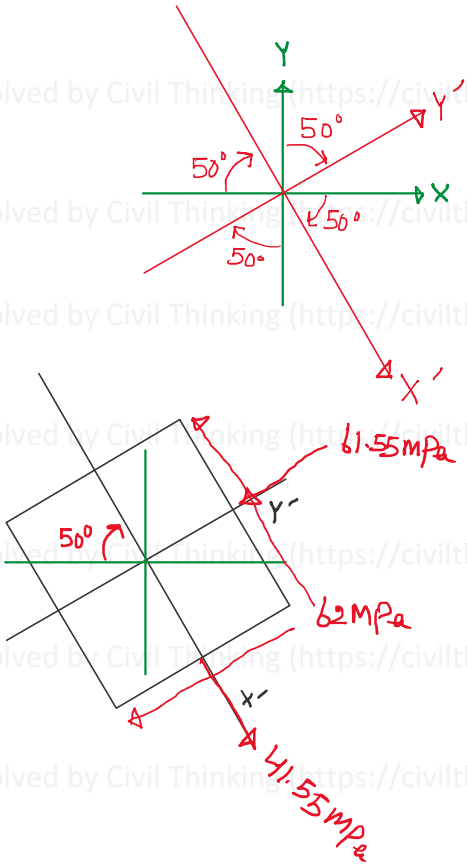
Plane Stress Transformation *question solution using*
STRESS TRANSFORMATION EQUATIONS

Determine the stress components acting on the inclined plane AB. Solve the problem using the method of ***STRESS TRANSFORMATION EQUATIONS.*** Draw the sketch.



Mechanics of Materials, R.C. Hibbeler 1oth Ed. Pearson



$\theta = -50^\circ \Rightarrow \boxed{2\theta = -100^\circ}$

$\sigma_x = -80\ MPa;\ \sigma_y = 60\ MPa;\ \tau_{xy} = -40\ MPa.$

$$\sigma_{x'} = \frac{\sigma_x+\sigma_y}{2} + \frac{\sigma_x-\sigma_y}{2}\cos 2\theta + \tau_{xy}\sin 2\theta = 41.55\ MPa$$

$$\sigma_{y'} = \frac{\sigma_x+\sigma_y}{2} + \frac{\sigma_x-\sigma_y}{2}\cos 2(90+\theta) + \tau_{xy}\sin 2(90+\theta)$$

$90^\circ+\theta = 90^\circ-50^\circ = 40^\circ \Rightarrow 2(90^\circ+\theta) = 2\times 40^\circ = 80^\circ$

$\Rightarrow \sigma_{y'} = -61.55\ MPa$

$$\tau_{x'y'} = \ominus \frac{\sigma_x-\sigma_y}{2}\sin 2\theta + \tau_{xy}\cos 2\theta = -62\ MPa$$

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