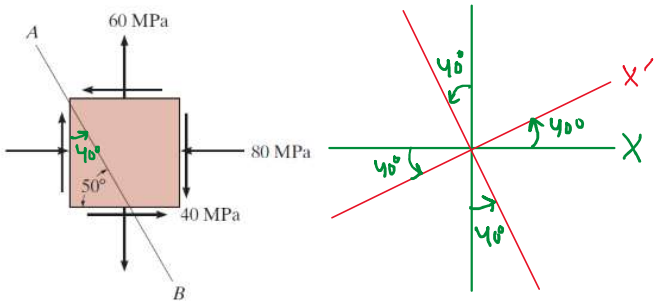
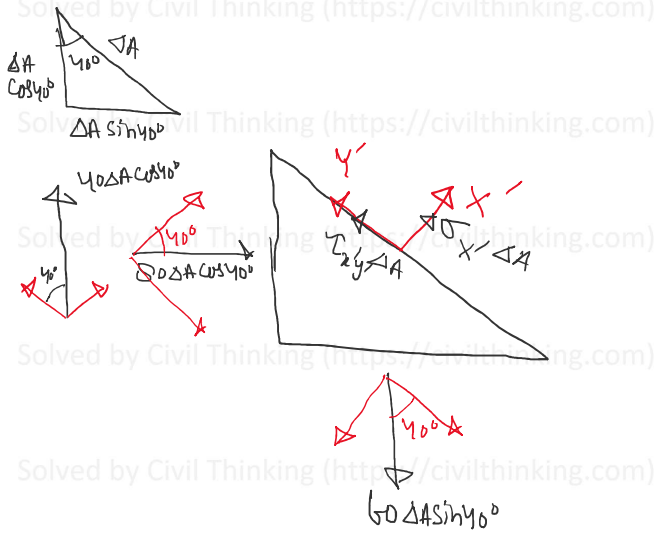
Plane Stress Transformation *question solution using Method of Equilibrium*

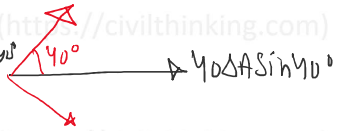
9–7. Determine the stress components acting on the inclined plane AB. Solve the problem using the method of equilibrium described in Sec. 9.1.



Probs. 9–7/8

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





$$+\nearrow \Sigma F_{x'} = 0 \;:\; \sigma_{x'}\Delta A - 60\Delta A\sin 40^\circ \sin 40^\circ + 40\Delta A\sin 40^\circ\cos 40^\circ + 80\Delta A\cos 40^\circ\cos 40^\circ + 40\Delta A\cos 40^\circ\sin 40^\circ = 0$$

$$\Rightarrow \sigma_{x'} = -61.55\ \text{MPa} = 61.55\ \text{MPa}\ [\text{compressive}]$$

$$+\nwarrow \Sigma F_{y'} = 0 \;:\; -\tau_{x'y'}\Delta A - 60\Delta A\sin 40^\circ\cos 40^\circ - 40\Delta A\sin 40^\circ\sin 40^\circ - 80\Delta A\cos 40^\circ\sin 40^\circ + 40\Delta A\cos 40^\circ\cos 40^\circ = 0$$

$$\Rightarrow \tau_{x'y'} = 62\ \text{MPa}$$

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