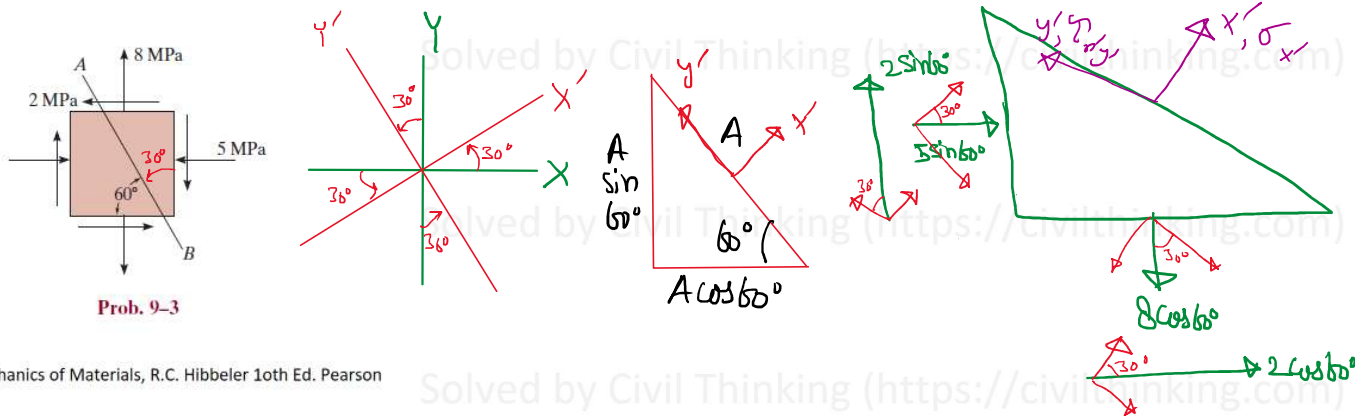


Plane stress transformation problems

9-3. The state of stress at a point in a member is shown on the element. Determine the stress components acting on the inclined plane AB . Solve the problem using the method of equilibrium described in Sec. 9.1.



Prob. 9-3

Mechanics of Materials, R.C. Hibbeler 10th Ed. Pearson

$$+\circlearrowleft \sum F_x = 0: \sigma_{x'} - 8 \cos 60^\circ \sin 30^\circ + 2 \cos 60^\circ \cos 30^\circ + 5 \sin 60^\circ \cos 30^\circ + 2 \sin 60^\circ \sin 30^\circ = 0$$

$$\Rightarrow \sigma_{x'} = -3.48 = 3.48 \text{ MPa (C)}$$

$$+\circlearrowleft \sum F_y = 0: -\tau_{x'y'} + 8 \cos 60^\circ \cos 30^\circ + 2 \cos 60^\circ \sin 30^\circ + 5 \sin 60^\circ \sin 30^\circ - 2 \sin 60^\circ \cos 30^\circ = 0$$

$$\Rightarrow \tau_{x'y'} = 4.63 \text{ MPa (C)}$$

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