

## Stress Homework Problems

1. Do problem 2.3.2 in the text (principal stresses)
2. Do problem 2.3.4 in the text (principal directions)
3. For a state of stress with respect to *the*  $x, y, z$  axes given by

$$[\sigma] = \begin{bmatrix} 40 & 40 & 30 \\ 40 & 20 & 0 \\ 30 & 0 & 20 \end{bmatrix} MPa$$

determine the normal stress and total shear stress acting on a plane whose normal is oriented at angles of  $40^\circ, 75^\circ, 54^\circ$ , respectively, with respect to the  $x, y, z$  axes. What is the direction of the total shear stress ?

4. For the state of stress

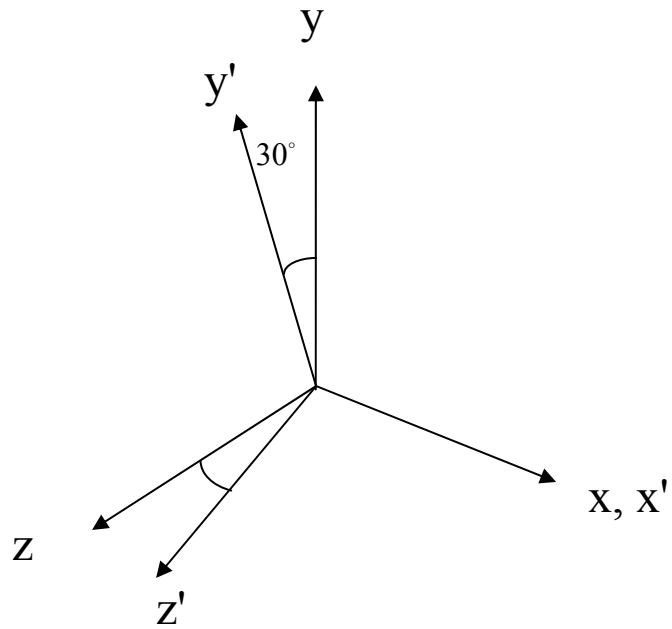
$$[\sigma] = \begin{bmatrix} 12 & 6 & 9 \\ 6 & 10 & 3 \\ 9 & 3 & 14 \end{bmatrix} MPa$$

determine the normal stress and the total shear stress acting on the octahedral plane

5. For the following state of stress with respect to the  $x, y, z$  axes

$$[\sigma] = \begin{bmatrix} 60 & 40 & -40 \\ 40 & 0 & -20 \\ -40 & -20 & 20 \end{bmatrix} MPa$$

determine the state of stress in the  $x', y', z'$  system obtained by making a  $30^\circ$  counterclockwise rotation about the  $x$ -axis as shown



6. If the state of stress at a point in a body is given by

$$[\sigma] = \begin{bmatrix} 12 & 4 & 2 \\ 4 & -8 & -1 \\ 2 & -1 & 6 \end{bmatrix} \text{ MPa}$$

determine the magnitude of the maximum shear stress at this point