Mechanical Engineering 635: Advanced Mechanics of Materials

Homework 1

1. The stress tensor at a point $P(x, y, z)$ in a solid is

$$\begin{pmatrix} 120 & 40 & 30 \\ 40 & 150 & 20 \\ 30 & 20 & 100 \end{pmatrix}$$

   (a) Determine the stresses with respect to a set of axes x', y', z' obtained by a clockwise rotation of 30° about the y axis.

   (b) Compute the stress invariants for both coordinate systems and verify that they are equal.

   (c) Compute the principal stresses using the unprimed axes (x, y, z).

   (d) Find the orientation of the principal planes with respect to the unprimed axes (x, y, z).