1 Exercise V-2

Given: Linear elastic isotropic material E=2·105 N/mm2 One principal stress is given: 8 N/mm2

Questions:
a) Find the other principal (eigen) stresses
b) Find the eigen-directions and make a sketch

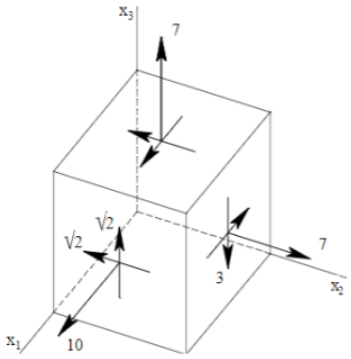
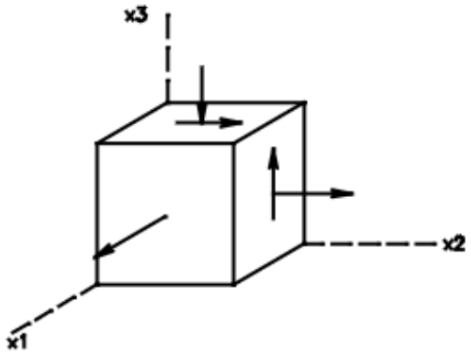


Figure 1: Stress matrix

2 Exercise V.3



Given: a stress-state: $\begin{bmatrix} 60 & 0 & 0 \\ 0 & 20 & 20 \\ 0 & 20\sqrt{3} & -20 \end{bmatrix}$ $E = 2 \cdot 10^5$ $v = 0.25$

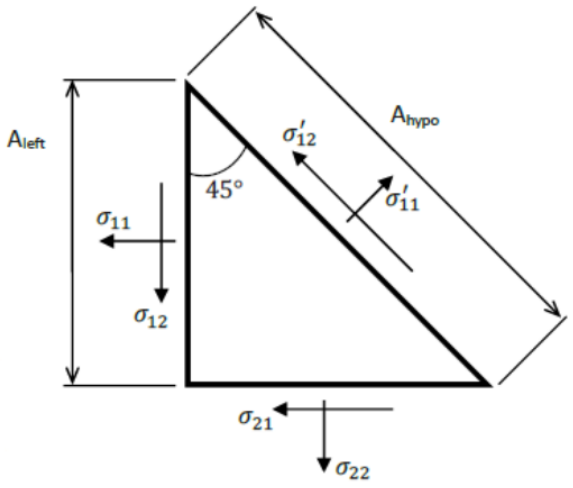
a)Compute the principal stresses

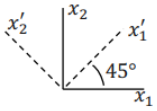
b) Compute the eigen-directions
c) The maximal shear-stress

3 Exercise V.10

Problem:
Given:

- In a point P of a body we have a plane-stress state with :$\sigma_{13} = \sigma_{23} = \sigma_{33} = 0$
- Given are these (mixed) stress components:
  $\sigma_{11} = 92Mpa$
  $\sigma'_{11} = 194Mpa$
  $\sigma'_{12} = -42Mpa$
- The material is linear elastic with:
  $E = 2 \cdot 10^5 MPa$
  $\upsilon = 0.25$





Questions:

- Give the stress tensor in the original $x_1x_2x_3$ system.
- Give the stress tensor in the new $x'_1x'_2x'_3$ coordinate system, as obtained by a rotation of the coordinates about 45° around the x_3-axis, as sketched above.
- Compute the eigen-stresses and the eigen-directions.
- Give the strain tensor in the $x'_1x'_2x'_3$ coordinate system.
- Compute the specific elastic energy in point P.