Figure 1:

Department of Mechanics
Lars Söderholm, 7152
e-mail lars.soderholm@mech.kth.se

Continuum Mechanics
Home assignment number 1, 2008
To be handed in Wednesday September 10

1) Two of the following formulas are impossible? Explain why

$$\begin{aligned} C_{ijk}d_jE_{jk} &= a_i, \\ B_{mi}A_{jmk}a_k &= C_{ji}, \\ A_{ij}B_{jk}a_k &= c_j \end{aligned}$$

2) Write

$$A_{ik}b_mC_{im} = d_k$$

without components.

3) Write

$$\mathbf{a} \cdot \mathbf{B}^T\mathbf{c}$$

in component notation.

4) Show that

$$\varepsilon_{imn}\varepsilon_{jmn} = a\delta_{ij}$$

and find the number a. Also calculate

$$\varepsilon_{lmn}\varepsilon_{lmn}.$$

Hint: you could use the formula

$$\varepsilon_{ijm}\varepsilon_{klm} = \delta_{ik}\delta_{jl} - \delta_{il}\delta_{jk}.$$

5) A plane has (unit) normal $\mathbf{n}$.
We know that the tensor

$$\mathbf{P} = \mathbf{1} - 2\mathbf{n} \otimes \mathbf{n}$$

reflects arbitrary vectors in the plane.
Assume that $\mathbf{n}$ lies in the plane spanned by $\mathbf{e}_1$ and $\mathbf{e}_2$ and makes the angle θ with $\mathbf{e}_1$. Find the matrix $[\mathbf{P}]$,calculate its components explicitly.