Physics 331

Problem J

The strain tensor ${\bf E}$ has matrix elements

$$\epsilon_{ij} = \frac{1}{2} \left(\frac{\partial u_i}{\partial r_j} + \frac{\partial u_j}{\partial r_i} \right).$$

Find the matrix elements ϵ'_{ij} of the traceless component of the strain tensor, **E**'.

Problem K

The stress-strain analog of Hooke's Law, where the stress is a linear function of the strain, has the form

$$\Sigma = - \mathrm{K} \, \mathrm{E}$$

where Σ is the stress tensor and **E** is the strain tensor, and **K** is some matrix.

As argued in the reading, and as we will cover in Wednesday's lecture, this stress-strain relation must have the form

$$\mathbf{\Sigma} = \alpha(e\mathbf{1}) + \beta \mathbf{E}'$$

(Note that this is \mathbf{E}' and *not* \mathbf{E} .) Use this to determine the matrix elements of \mathbf{K} in terms of α and β .