459.731 Theory of Poroelasticity

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Assignment #3 (22 March)

due by 29 March 2010

1 Evaluate the following expressions involving the Kronecker delta δ_{ij} for a range of three on the indices.

(a) δ_{ii}

(b) $\delta_{ij}\,\delta_{ij}$

(c) $\delta_{ij}\,\delta_{ik}\,\delta_{jk}$

2. For the permutation symbol ε_{ijk} show by direct expansion that

(a) $\varepsilon_{ijk}\,\varepsilon_{kij} = 6$

(b) $\varepsilon_{ijk}\,a_j a_k = 0$

(c) $\det(a_{ij}) = \det(\mathbf{A}) = \varepsilon_{rst} a_{r1} a_{s2} a_{t3}$

3. $\mathbf{z}$ is the vector product of two vectors, $\mathbf{x} = (x_1, x_2, x_3)$ and $\mathbf{y} = (y_1, y_2, y_3)$. Show that $\mathbf{z} = \mathbf{x} \times \mathbf{y}$ can be expressed as;

$z_i = \varepsilon_{ijk}\, x_j y_k$