

Advanced rock mechanics

Semester 1, 2009

Homework #3 (16 March)

due by 22 March 2009

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;

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