Mathematical Physics — PHZ 3113

Levi-Civita Tensor Homework 2

(January 18, 2013)

1. Use the identity

$$\sum_{i=1}^{3} \epsilon_{ijk}\epsilon_{ilm} = \delta_{jl}\delta_{km} - \delta_{jm}\delta_{kl} \qquad (1)$$

to eliminate the vector products from the expression

$$\vec{a} \times \left(\vec{b} \times \vec{c}\right) \qquad (2)$$

2. Use the definition

$$\left(\vec{b} \times \vec{c}\right)_i = \sum_j \sum_k \epsilon_{ijk} b_j c_k \qquad (3)$$

of the i^{th} component of the vector product $\vec{b} \times \vec{c}$ to proof

$$\vec{a} \cdot \left(\vec{b} \times \vec{c}\right) = \vec{b} \cdot \left(\vec{c} \times \vec{a}\right) = \vec{c} \cdot \left(\vec{a} \times \vec{b}\right) \ . \qquad (4)$$