

Part of Hints for to Hw 3

Math 321

Section 1.6

2.(a). The final answer is a_i . I don't want to write the corresponding \sum notation here. However, if you are trying to understand Einstein's convention, you should do this.

(c). To overcome this difficulty, we can let $a_i = 2$, $b_j = j$. Then use a_i, b_j and Einstein's convention to finish simplifying.

3. (a). $\epsilon_{jkl}a_j = \epsilon_{klj}a_j$

(b). $a_k b_i - b_k a_i = 2k * i^2 - 2 * ik^2$

(c). (If I didn't make any mistakes)

$\epsilon_{mlq}c_q b_l a_m - \epsilon_{mlq}b_m a_l c_q = \epsilon_{mlq}c_q b_l a_m - \epsilon_{lmq}b_l a_m c_q = 2\epsilon_{mlq}c_q b_l a_m$ which is twice of a determinant.

(d). I'll show you the first as an example. $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = (a_i b_j \epsilon_{ijk} \vec{e}_k) \cdot (c_p d_q \epsilon_{pqr} \vec{e}_r) = a_i b_j c_p d_q \delta_{kr} \epsilon_{ijk} \epsilon_{pqr} = a_i b_j c_p d_q \epsilon_{ijk} \epsilon_{pqk} = a_i b_j c_p d_q (\delta_{ip} \delta_{jq} - \delta_{iq} \delta_{jp}) = a_i c_i b_j d_j - a_i d_i b_j c_j$ This makes sense, because

$(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = ((\vec{c} \times \vec{d}) \times \vec{a}) \cdot \vec{b} = ((\vec{c} \cdot \vec{a})\vec{d} - (\vec{d} \cdot \vec{a})\vec{c}) \cdot \vec{b} = (\vec{c} \cdot \vec{a})(\vec{d} \cdot \vec{b}) - (\vec{d} \cdot \vec{a})(\vec{c} \cdot \vec{b})$

Section 1.7

1. $\det(\vec{a}, \vec{b}, \vec{c}) = 0$ means they are not linearly independent. $\neq 0$ means *L.I.*. In detail, > 0 means right-handed and thus < 0 means...

#1. You add one more dimension \vec{e}_3 to argue.