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). $a_kb_i - b_ka_i = 2k * i^2 - 2 * i k^2$
(c). (If I didn’t make any mistakes)
\[\epsilon_{mlq}c_qb_l = \epsilon_{mlq}b_la_m - \epsilon_{lmp}b_la_m c_q = 2\epsilon_{mlq}c_qb_l a_m\] which is twice of a determinant.
(d). I’ll show you the first as an example. $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = (a_i b_j \epsilon_{ijk} \vec{e}_k) \cdot (c_p d_q \epsilon_{pqr} \vec{e}_r) = a_i b_j c_p d_q \delta_{kr} \epsilon_{ijk} \epsilon_{pqr} = a_i b_j c_p d_q (\delta_{ip} \delta_{jq} - \delta_{iq} \delta_{jp}) = a_i c_i b_j d_j - a_i d_i b_j c_j$
This makes sense, because $(\vec{a} \times \vec{b}) \cdot (\vec{c} \times \vec{d}) = ((\vec{a} \times \vec{d}) \times \vec{b}) = ((\vec{c} \cdot \vec{d}) \vec{a} - (\vec{d} \cdot \vec{a}) \vec{c}) \cdot \vec{b} = (\vec{c} \cdot \vec{a})(\vec{d} \cdot \vec{b}) - (\vec{d} \cdot \vec{a})(\vec{c} \cdot \vec{b})$

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.