Homework #5

Problem 8 - 2.1.9:

We need to calculate

$$\epsilon_{ijk}\epsilon_{pqk}. \tag{1}$$

We see that in R^3 the indices can only take 3 values. This means that they have to be all different to each other. Once k is fixed there are two possibilities: i) $i = p$ and $j = q$ or ii) $i = q$ and $j = p$ with i and j different from k in both cases. In the first case $\epsilon_{ijk} = \epsilon_{pqk}$ and in the second $\epsilon_{ijk} = -\epsilon_{pqk}$ then,

$$\epsilon_{ijk}\epsilon_{pqk} = \delta_{ip}\delta_{jq} - \delta_{iq}\delta_{jp}. \tag{2}$$