Homework #5

Problem 7 - 2.1.8:

a) δ_{ii} is just the trace of the 3×3 identity matrix, i.e., 3.

b) $\delta_{ij}\epsilon_{ijk} = 0$ since δ_{ij} is non zero if $i = j$ but in this case ϵ_{ijk} vanishes.

c) $\epsilon_{ipq}\epsilon_{jpq}$ does not vanish if the three indices are different. This means that i must be equal to j which gives us a δ_{ij}. But once i is fixed p can take two values and a factor of 2 appears (for example, if i=j=1 then p=2, q=3 gives the same contribution as p=3, q=2).

d) $\epsilon_{ijk}\epsilon_{ijk} = 6$ since there are 6 terms for which the product is 1: i can take 3 values, once i is fixed j can take 2 values and there is only one value left for k. So the total number of terms is $2 \times 3 = 6$.