

Math 335-002
Homework #4
Due date: February 12

Note that on February 14 we are having our first Midterm Exam!

Please show all work in detail to receive full credit. Late homework is not accepted.

1. Re-write equation (a) in suffix notation and convert equation (b) into a vector equation (do not simplify):

$$\begin{aligned} \text{a) } & \mathbf{a} \cdot \mathbf{b} \times \mathbf{c} + (\mathbf{a} \cdot \mathbf{c})(\mathbf{a} \cdot \mathbf{b}) = 3|\mathbf{c}|^2 \\ \text{b) } & \varepsilon_{mkl} a_n d_l c_k b_n = a_k d_k c_n a_m b_n \end{aligned}$$

2. Simplify the following expressions:

$$\begin{aligned} \text{a) } & \delta_{kn} \delta_{jk} \delta_{ni} \\ \text{b) } & \varepsilon_{jkm} \delta_{kn} \delta_{mj} \end{aligned}$$

3. Simplify and translate the following suffix notation equation into vector notation:

$$d_j b_k d_m \delta_{mk} + b_k c_m d_n c_k \varepsilon_{jmn} = \delta_{kl} a_m \delta_{lj} a_k b_m$$

4. Check the equation (4.12) on page 72 (the expansion of a product of alternating tensors in terms of the Kronecker delta tensor, same equation I've written in class) by calculating the left- and the right-hand sides of the equation for any two different sets of values of the free suffixes (i, j, l , and m). Choose at least one of these two suffix combinations in such a way that the two sides of the equation do not equal to zero.

5. Use equation (4.12) to simplify the following suffix notation expressions:

$$\begin{aligned} \text{a) } & \varepsilon_{ikm} \varepsilon_{mlj} \delta_{kl} \\ \text{b) } & \varepsilon_{ikm} \varepsilon_{mlj} a_k b_l \end{aligned}$$