Homework No. 06 (2019 Spring)

PHYS 301: Theoretical Methods in Physics

Due date: Wednesday, 2019 Feb 27, 9:00 AM, in class

1. (**20 points.**) The Pauli matrices are traceles Hermitian matrices that satisfy

$$\sigma_i \sigma_j = \delta_{ij} + i\varepsilon_{ijk}\sigma_k, \tag{1}$$

where i, j, are either $1, 2$, or 3. Evaluate the commutation relation

$$\big[\sigma_i, \sigma_j\big]. \tag{2}$$

Then, evaluate the anti-commutation relation

$$\big\{\sigma_i, \sigma_j\big\}. \tag{3}$$

2. (**20 points.**) Using the property of Kronecker δ-function and Levi-Civita symbol evaluate the following using index notation.

$$\delta_{ij}\delta_{ji} = \tag{4a}$$
$$\delta_{ij}\varepsilon_{ijk} = \tag{4b}$$
$$\varepsilon_{ijm}\delta_{mn}\varepsilon_{nij} = \tag{4c}$$