Quantum Field Theory 2 – Tutorial 3

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Problem 1: Grassmann algebra

Consider a set of Grassmann generators $c_1, \ldots, c_n$. Show that the set $\mathcal{G}$ of linear combinations

$$a = a^{(0)} + a_i^{(1)} c_i + a_{ij}^{(2)} c_i c_j + \cdots + a^{(n)} c_1 c_2 \ldots c_n$$

with complex numbers $a^{(0)}, a_i^{(1)}, \ldots, a^{(n)}$ constitutes an algebra. To that end you have to show first that the set is a vector space over the complex numbers with the corresponding rules for addition and scalar multiplication. Thereafter you have to define an appropriate rule to multiply two elements of $\mathcal{G}$.

Which elements of the Grassmann algebra $\mathcal{G}$ have an inverse?