

**Homework 9 for June 19**

The following problems are to be handed in (in the designated box near the library on the first floor), at the latest, at 16:00 on June 19.

The numbers of the problems refer to the lecture notes.

**Exercise 1:** Solve Problem 9.4.

**Exercise 2:** Let  $\mathfrak{H}$  be a separable Hilbert space and  $\{u_i\}_{i \in \mathbb{N}}$  an orthonormal basis for  $\mathfrak{H}$ . Let  $|0\rangle \in \mathcal{F}^{B,F}(\mathfrak{H})$  be the vacuum vector. Prove that the family

$$\left\{ |u_{i_1}, u_{i_2}, \dots, u_{i_M}\rangle := (n_{i_1}! \cdots n_{i_M}!)^{-1/2} a_{\pm}^*(u_{i_M})^{n_{i_M}} \cdots a_{\pm}^*(u_{i_1})^{n_{i_1}} |0\rangle, \right. \\ \left. \text{where } M = 1, 2, \dots; 1 \leq i_1 < i_2 < \cdots < i_M \text{ run over } \mathbb{N}, \right. \\ \left. \text{and } n_1, \dots, n_M \text{ run over } \mathbb{N} \text{ (for bosons) or are equal to 1 (for fermions)} \right\}$$

is an orthonormal basis for  $\mathcal{F}^{B,F}(\mathfrak{H})$ .

**Exercise 3:** Solve Problem A.8.1.

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