Exercises for week 11

Exercise 1

The figure shows a Feynman diagram that appears in the perturbation expansion of the 2-point function $\langle \Omega | T\{\phi(x)\phi(y)\} | \Omega \rangle$ in ϕ^4 theory.



(a) What is the order of the diagram (i.e. what is the power of λ associated with it)?

(b) Use the Feynman rules to write down the mathematical expression for the diagram. (Just denote the symmetry factor by S and don't attempt to evaluate any of the integrals.)

(c) Use (the numerator in) the expression for the perturbation expansion of the 2-point function to calculate the symmetry factor S for this diagram.

Exercise 2

Problem 5.6.7 in JOA's lecture notes. (There is a typo above Eq. (5.105): it should say $\mathcal{H} \to \mathcal{K}$.) This problem is relevant for upcoming lectures, when we'll make use of the grand canonical ensemble.