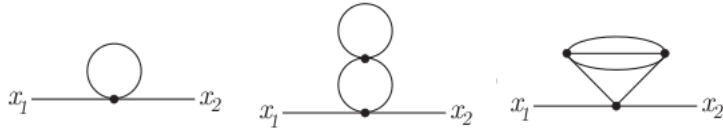


QFT Exercises 11

Due on 29.01.15

Topics: Feynman rules and Feynman diagrams

- (20%) Use the Wick theorem to determine the symmetry factor for the following diagrams:



- (40%) Find the integral expression for the diagram below using the Feynman rules in coordinate space. From that result find the integral expression for the diagram in momentum space. Finally, evaluate the loop integral in dimensional regularization (for an arbitrary value of d) and show that it diverges for $d = 4$.



- (20%) Draw the different diagrams that contribute to the process $\varphi\varphi \rightarrow \varphi\varphi\varphi\varphi$ at tree-level in the φ^4 theory. Draw also at least two diagrams contributing to that process at one-loop.
- (20%) Consider a φ^3 theory ($\mathcal{L}_{int} = -\frac{g}{3!}\varphi^3$). Draw all the tree-level diagrams that contribute to the process $\varphi\varphi \rightarrow \varphi\varphi$. Draw also at least two diagrams contributing to that process at one-loop.