

Problem Sheet 4

Due date: by Thursday 26th March

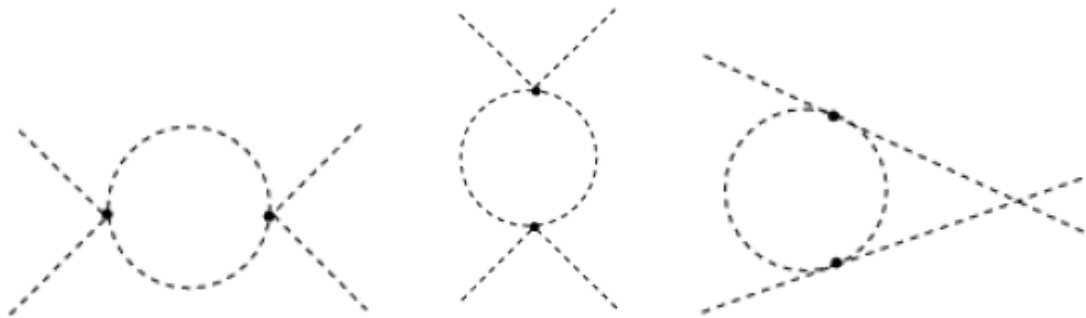
Q1 Starting from the path integral expression for the partition function Z , derive the Feynman Rule for the 3 gauge boson vertex in a non-abelian gauge theory.

[3]

Q2 In $\lambda \phi^4$ theory

$$\mathcal{L} = \frac{1}{2}(\partial_\mu \phi)^2 - \frac{1}{2}m^2 \phi^2 - \frac{1}{4!}\lambda \phi^4$$

The one loop corrections to the four point vertex are given by the diagrams



Compute the divergent term in the coupling renormalization factor Z .

[5]

Q3 In $\lambda \phi^4$ theory draw the lowest order Feynman Diagram that contributes to Z_1 , the external scalar wave function renormalization factor.

How do Z and Z_1 enter into the renormalized coupling λ_R ?

[2]