Homework 4: Due at class on Nov 9
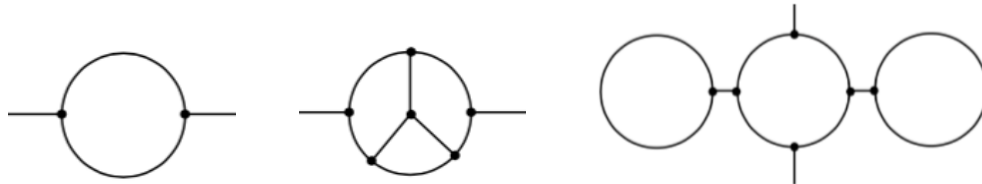
1 Feynman rules in ϕ^3 theory

1.1

Give the Feynman rules for correlation functions to the propagator, the vertex and the external points in position- space and derive from these the Feynman rules in momentum-space for the $\lambda\phi^3$ theory, i.e. $\mathcal{L}_{\text{int}} = -\frac{\lambda}{3!}\phi^3$.
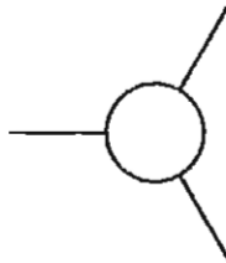
1.2

Calculate the symmetry factors for the following diagrams:

1.3

Now let us consider the one-loop correction to the ϕ^3 term, given by the following diagram. Write down the corresponding amplitude using the Feynman rules in terms of inte-

grals over the intermediate points and Wick contractions, represented with factors of D_F.

2 Peskin & Schroeder Problem 4.3 (linear sigma model)