

Exercise 1.

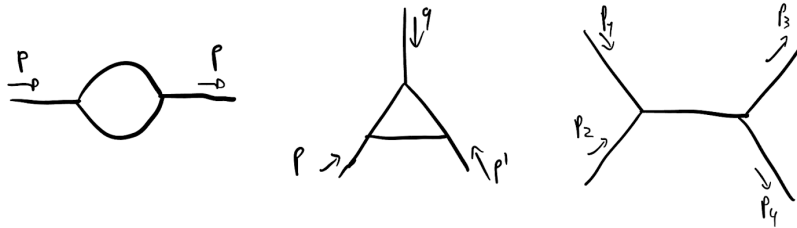
Derive the Feynman rules for the following Lagrangian interactions:

- 1) $\mathcal{L}_I = -\frac{g}{3!}\varphi(x)^3$
- 2) $\mathcal{L}_I = -\frac{g}{2}\varphi(x)^2\chi(x)$
- 3) $\mathcal{L}_I = -\lambda(\varphi(x)^*\varphi(x))^2$
- 4) $\mathcal{L}_I = C\chi(x)^2(\partial_\mu\varphi(x))(\partial^\mu\varphi(x))$
- 5) $\mathcal{L}_I = ig[\varphi(x)^*(\partial_\mu\varphi(x)) - (\partial_\mu\varphi(x)^*)\varphi(x)]A^\mu(x)$

Exercise 2.

Write the expression of the amplitude $i\mathcal{M}$ for the following diagrams in the theory of a real scalar $\varphi(x)$ with interactions:

- 1) $\mathcal{L}_I = -\frac{g}{3!}\varphi^3$:



- 2) $\mathcal{L}_I = -\frac{\lambda}{4!}\varphi^4$:

