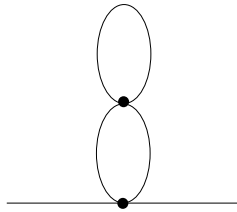


FY3464 Quantum Field Theory

NTNU

Problemset 5**Institutt for fysikk****Problem 1**

Use the Feynman rules we developed for harmonic oscillator perturbation theory [$L_I(t) = -\frac{1}{4!}\lambda\phi^4(t)$] to compute a simple analytical expression for the following diagram.

**Problem 2**

A propagator may in general have several poles. Assuming that we are close to one of these poles, in particular $\omega^2 \simeq (3m_0)^2$, derive an approximate expression for the residue of the propagator to order $O(\lambda^2)$ for a simple harmonic oscillator with $L_I(t) = -\frac{1}{4!}\lambda\phi^4(t)$. To solve this, use the expression we found for $\Sigma_0(\omega)$ in the lectures up to order $O(\lambda^2)$.