QFT vocab

Lagrangian (strictly speaking Lagrangian density)

$\mathcal{L}$

in ϕ^4 theory

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

if $m=0$ say massless

ϕ is a real scalar field

$\phi : \mathbb{R}^4 \to \mathbb{R}$

Action $S = \int d^D x \, \mathcal{L}$

if you minise the action you get the classical case

D is the dimension of space-time

Generating functional

$$Z[J] = \int D\phi \, \exp\left(i \int d^D x \, (\mathcal{L} + J\phi) \right)$$

these are path integrals or functional integrals

they are not well-defined

n-point correlation function or Green function

$$\langle \phi(x_1)\phi(x_2)\dots\phi(x_n) \rangle = \frac{\int D\phi \; \phi(x_1)\phi(x_2)\dots\phi(x_n) \exp(iS)}{\int D\phi \exp(iS)}$$

normalizing by the path integral for the vacuum