

Physics 722, Spring 2016

Problem Set 7

Due Thursday, March 31.

Renormalizability

- a) We argued that in four spacetime dimensions, a theory of spin-0 and spin-1/2 fields is generally not renormalizable if the Lagrangian contains operators of mass-dimension > 4 , and is renormalizable if it contains all operators (possibly constrained by symmetries) of mass-dimension ≤ 4 . What is the corresponding statement in d spacetime dimensions?
- b) Is a theory of fermions with a $(\bar{\psi}\psi)^2$ interaction renormalizable in four dimensions? In three dimensions?
- c) Assuming that from the perspective of momentum power counting, gauge fields behave like scalars, do you expect QED to be renormalizable in 4+1 dimensions?