Physics 722, Spring 2019
Problem Set 6
Due Thursday, March 21.

1. *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 $(\overline{\psi}\psi)^2$ interaction renormalizable in four dimensions? In three dimensions?

c) Assuming that the same rule applies to gauge theories, do you expect QED to be renormalizable in 4+1 dimensions?