

Physics 615
Homework #6

Fall, 2007
Due: Oct. 18

1 [15 pts] Do problem 3.5 from Peskin and Schroeder. This is the simplest presentation of a model with supersymmetry. Note that the F field does not correspond to particles, as its field equation is not an equation of motion, so to express the particle content of this action F needs to be solved for and the expression substituted back into the Lagrangian.

Some hints for problem 3.5:

Don't forget that the infinitesimal symmetry parameter ϵ is a two-component spinor which is a *Grassmann* variable, and therefore **anticommutes** with all spinors.

In part (c), in generalizing to N fields ϕ , χ , and F , there is still only one ϵ , not N of them.

Remember that to be a supersymmetry, we don't need to have $\delta\mathcal{L} = 0$, but only that $\delta\mathcal{L}$ is a total derivative $\delta\mathcal{L} = \partial_\mu\Lambda^\mu$ for some Λ^μ .

It will be essential to recall that each χ_i has exactly two components, χ_i^r for $r = 1, 2$.