Physics 325: Elementary Particle Physics
Spring 2010

Problem Set 3

Due: Thu 11 Feb 2010

Reading: Please finish Chapter 4 in Griffiths.

Problems:

4.6. The rotation group.

4.10. Think like Pauli. Note that Pauli agonized over introducing a single new elementary particle for sake of salvaging a basic conservation law of nature. You might contrast this conservativism with the predictions of supersymmetry, our best guess for physics beyond the standard model. Supersymmetry introduces a new, heavier superpartner for every observed elementary particle in the standard model!


4.20. Useful properties of the Pauli matrices. Please read Problem 4.19. You may assume all of the results proven in that problem.

4.21. $SU(2)$ rotations.

4.23. Angular momentum operators for spin-1 and spin-3/2. Note that the spin-1 matrices in this problem differ from the generators $t_a$ of $SO(3)$ we introduced in class. The reason is that the components of vectors and matrices in this problem use a spherical basis ($m = +1, 0, -1$), whereas we assumed a Cartesian basis (ordinary $x, y, z$ components) when discussing $SO(3)$ rotations.