Physics 8.322, Spring 2003
Homework #8

Due **Wednesday, April 16** by 4:00 PM in the 8.322 homework box in 4-339B.

1. Sakurai: Problem 6, Chapter 6 (page 378)

2. Find all Young diagrams for $N = 5$. Compute D_λ for each diagram, and check $\sum_\lambda D_\lambda^2 = N!$.

3. (a) Describe the decomposition of $(\mathcal{H}_2)^5$ into irreps of S_5 and $SU(2)$.

   (b) Describe the decomposition of $(\mathcal{H}_3)^4$ into irreps of S_4 and $SU(3)$.

4. Write out all the ^2P wavefunctions explicitly for a p^3 configuration.

5. What are the possible multiplets for a d^3 configuration? Characterize the space and spin parts of the wavefunction for each multiplet under S_3 permutations.

6. Find the wavefunction for a proton with $s_z = +1/2$ in a basis of flavor and spin quark eigenstates (*e.g.* $\Delta^{++} = |u^\uparrow u^\uparrow u^\uparrow\rangle$). You may assume the color wavefunction is antisymmetric.