Problem Set 8

Physics 234 Spring Quarter 2004 H.J.Frisch HEP320 (702-7479)
May 17, 2004 Office Hours: Wednesday, Friday afternoons (Please call first, or arrange after class).

Due Monday, May 24 (hand in at class).

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Reading: Shankar, Chapter 11, Sections 11.3 and 11.4, and Chapter 12, Sections 12.1 through 12.5. I also recommend *Elementary Theory of Angular Momentum*, by M. E. Rose (this is a beautiful book).

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Problems:

1. **The Exchange Operator:** Shankar, Exercise 10.3.5
2. **Parity:** Starting with the Hamiltonian and Parity operators, show that the eigenstates of the quantum harmonic oscillator are eigenstates of parity, and find the eigenvalues. Give an explicit example wave-function for each of the eigenvalues.
3. **Representations of $\vec{J}$:** Shankar, Exercise 12.5.2
4. **Non-commutivity of J_i:** Shankar, Exercise 12.5.3
5. **Legendre Polynomials:** Shankar, Exercise 12.5.10
6. **Spherical Harmonic Practice:** Shankar, Exercise 12.5.13