Phys 402
Spring 2009
Homework 5
Due Friday, March 13, 2009 @ 9 AM

1. Griffiths, 2nd Edition, Problem 6.38 **Hyperfine transition in the ground state of Deuterium. Find the hyperfine states by combining spin-1 with spin-1/2.**

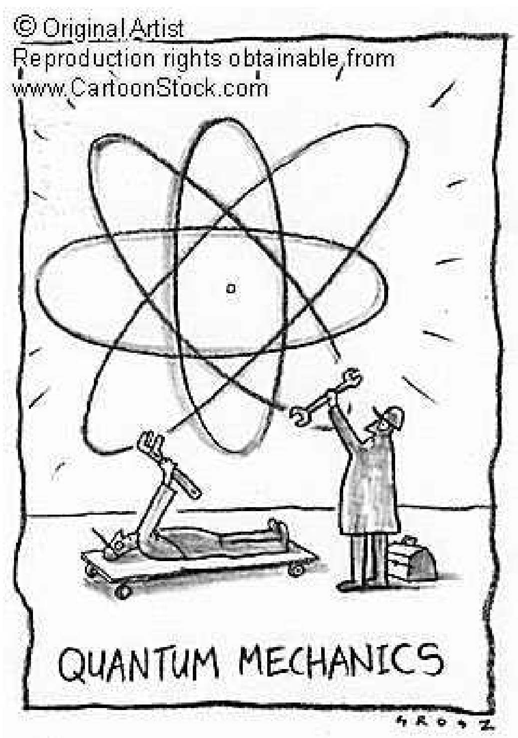
2. Griffiths, 2nd Edition, Problem 4.34 **Raising and lowering operations on the coupled spin states |1 0>, |0 0>. S^2 calculation.**

3. Griffiths, 2nd Edition, Problem 5.4 **Carry out the normalization of symmetrized wavefunctions**

4. Griffiths, 2nd Edition, Problem 5.5 **2-particles in the infinite square well. Ground state and first two excited state wavefunctions for distinguishable, fermion and boson particles.**

Extra Credit #7
Griffiths, 2nd Edition, Problem 6.21 **Zeeman Effect in Hydrogen for n = 2**

Extra Credit #8
Griffiths, 2nd Edition, Problem 4.56 (a) only **Generating function for rotations**



Physics 402
Spring 2009
Prof. Anlage
Discussion Worksheet for March 11, 2009

1. The Slater determinant is a very handy way to construct antisymmetric wavefunctions of N-identical particle systems. Suppose you want to distribute particles into states *a*, *b*, *c*, etc. One forms rows of a determinant made up of $\psi_a(1)\quad \psi_b(1)\quad \psi_c(1)\ \ldots$ followed by the next row, written as $\psi_a(2)\quad \psi_b(2)\quad \psi_c(2)\ \ldots$, where "1" and "2" represent the coordinates of particle 1, particle 2, etc. Multiply the determinant by $1/\sqrt{N!}$ for normalization.

a) Form the antisymmetric wavefunction for two identical particles in states *a* and *b*.

b) Form the antisymmetric wavefunction for three identical particles in states *a, b* and *c*. See what happens if *a* and *c* are the same state.

2. Consider a spin-1/2 particle. It is known to be in the "up" state after a measurement of S_z. Show that in this state $\langle S_x \rangle = \langle S_y \rangle = 0$. Explain this result geometrically.