Phys 402
Spring 2009
Homework 2
Due Friday, February 13, 2009 @ 9 AM

1. Griffiths, 2nd Edition, Problem 4.22 (a) and (b) only **Ang. Mom. raising operator L_+ and Y_ℓ^ℓ.**

2. Griffiths, 2nd Edition, Problem 4.25 **Reproduce Pauli's argument against the "spin" interpretation of the "two-valudeness not describable classically"**

3. Griffiths, 2nd Edition, Problem 4.26 (a) only **Spin operator/matrix commutators**

4. Griffiths, 2nd Edition, Problem 4.27 **Normalization, expectation values and uncertainties of a spin state**

5. Griffiths, 2nd Edition, Problem 4.29 **Eigenvalues and eigenfunctions of S_y**

Extra Credit #3
Griffiths, 2nd Edition, Problem 4.31 **Construct spin matrices for spin-1 particles**

Extra Credit #4
Griffiths, 2nd Edition, Problem 4.33 **Spin precession in an oscillating magnetic field, time-dependent Schrödinger equation**

Office Hours Thursday, 3:00 – 4:30 PM, Room 0360 (see class web site for directions to the room)

TA (Wai-Lim Ku) Office Hours, Thursday 4:30 – 5:30 PM, Room 0104

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

1. The electron in a hydrogen atom occupies the combined spin and position state

$$\Psi = R_{21}(r)\left(\sqrt{\frac{1}{3}}\,Y_1^0(\theta,\phi)\,\chi_+ + \sqrt{\frac{2}{3}}\,Y_1^1(\theta,\phi)\,\chi_-\right)$$

a) If you measured the orbital angular momentum squared (L^2), what values might you get, and what is the probability of each?
b) Same for the z component of orbital angular momentum (L_z)
c) Same for the spin angular momentum squared (S^2)
d) Same for the z component of spin angular momentum (S_z)

2. Show that it is impossible for a spin-1/2 particle to be in a state $\chi = \begin{pmatrix} a \\ b \end{pmatrix}$ such that $\langle S_x \rangle = \langle S_y \rangle = \langle S_z \rangle = 0$. Hint: start by examining $\langle \sigma_z \rangle \sim \langle S_z \rangle$.