Lecture 3: Physics 212

Monday, January 25, 1999
H. S. Greenside

1 Reading

1. Chapter 10 of French and Taylor.
2. Sections 4.3 and 4.4 of Griffiths (angular momentum and spin).

2 Concepts to Understand

Please make sure you understand the following concepts:

1. You should understand in complete detail how to think about Figure 7-5 (page 284 of French and Taylor), both classically and quantum mechanically. In particular, make sure you understand why this figure implies the need for introducing the idea of a quantum amplitude.
2. You should understand the three basic rules for combining quantum amplitudes: they add for independent events, they multiply for dependent events, and one takes the magnitude squared of the final amplitude to get the overall projection probability.
3. You should understand why the wave function $\psi(x)$ from the time-independent Schrodinger equation is really an amplitude $\psi(x) = \langle x|\psi\rangle$, i.e., projection amplitude of the state $|\psi\rangle$ onto the position state $|x\rangle$. This is discussed on page 305 of French and Taylor and (in more mathematical detail) on pages 106-107 of Griffiths.
4. You should understand Figure 7-12 on page 295 of French and Taylor: how to write down the overall amplitude $\langle y'|y\rangle$ and why one needs to use complex-valued amplitudes.
5. You should understand the key idea of Section 7-8, that a state vector $|\psi\rangle$ can be written as a superposition of two arbitrary orthogonal complete vectors (see Eq. (7-24) on page 301.
6. You should understand some of the quantitative details of the Stern-Gerlach experiment and, in particular, why it was successful in showing that angular momentum was quantized.