

Chemistry 542
Fall, 2002
Problem Set 6
Due Wednesday, October 23

Read Chapter 5 and Section 7.4. You should already be familiar with 7.1 and 7.2, and it wouldn't hurt to read 7.3, even though we won't deal with it for a while.

1. Answer all the questions that are posed in Lecture 17 on the web. The questions appear in items 2, 5, 8, 9, 11 – 16. These are all short (and generally easy) proofs.
2. Demonstrate that the Uncertainty Principle is satisfied for all eigenfunctions of the harmonic oscillator. You should be able to answer this question without evaluating any integrals explicitly. (Hint: Look at the previous problem set.)
3. Use the generating functions for the Legendre Polynomials to determine $Y_{2,0}$, $Y_{2,1}$, and $Y_{2,2}$. Compare your answers with Table 5.1 in Levine. You need not derive the normalization constants.
4. Use the ladder operators to answer the previous question. If we don't get to it on Monday, the problem will be deferred until next week.
5. Show that $S_{3,0}$ and $S_{1,0}$ are orthogonal. Are $S_{2,0}$ and $S_{2,1}$?

Levine 5.24 and 5.25.