Physics 5382 Professor Scalise
Homework Assignment #5 Fall 2015

1. Read Griffiths sections 3-1 and 3-2. Did you read all the pages?

2. In last week's homework #4 problem 3,

   (a) show explicitly that $\sum_{n=1}^{\infty} |c_n|^2 = 1$ by summing an infinite series.

   (b) find the expectation value of the Hamiltonian $< H >$ by summing a different infinite series.

   (c) between which energy eigenvalues (E_1, E_2, E_3, etc.) does $< H >$ lie?

3. Find classical turning points of the first three levels of the quantum harmonic oscillator in terms of m, ω, $\hbar$, and constants.

4. Show the orthogonality of the Hermite polynomials

   (a) $H_1(z)$ and $H_2(z)$

   (b) $H_2(z)$ and $H_4(z)$

   Don't forget to include the so-called weight function $\exp(-z^2)$ in the integrals.

5. Find commutators

   (a) $[\hat{x}, \hat{p_x}^2]$

   (b) $[\hat{x}^2, \hat{p_x}^2]$

   in terms of numbers, constants (like $\hbar$), and single powers of the operators $\hat{x}$ and $\hat{p_x}$.