

# Physics 113 Quantum Theory Seminar

## Assignment 11 April 04, April 05, 2011

This week we continue to study Time-Independent Perturbation Theory.

### Part 1: Readings

**Zettili** - Chapter 9 Section 9.3 Pages 507-515

**Boccio** - Chapter 10(Pages 854-901 Sections 10.5-10.8).

All new material.

You must do the readings BEFORE attempting the problems in order to get a good grasp of the overall content of the week's material to be understood. A problem should then make you look more carefully at specific parts of the readings that are necessary for the solution of that particular problem!

Prior to discussing any problems, we will deal with any questions and/or discussion of the readings.

### Part 2: Everyone Problems

**Everyone must do all of these problems.**

Random choice of presenter.

1. Z9-27 - Variational Method
2. Z9-33 - Variational Method Again
3. Boccio 10.9.15 - Another Perturbed Oscillator
4. Boccio 10.9.20 - A Perturbation with 2 Spins
5. Boccio 10.9.22 - Spherical cavity with electric/magnetic fields
6. Boccio 10.9.49 A Perturbation Example

### Part 3: Extra Problems - Presentations

Each seminar member has responsibility for 2 problem solutions/presentation.  
Look at/try to solve other problems besides your own responsibility.  
You will not understand other solutions without attempting or at least thinking about the problem before seminar.

Presentation #1 \_\_\_\_\_

Boccio 10.9.16 - Helium from Hydrogen - 2 Methods

Boccio 10.9.32 - Variational Method 2

Presentation #2 \_\_\_\_\_

Boccio 10.9.17 - Hydrogen atom + xy perturbation

Boccio 10.9.33 - Variational Method 3

Presentation #3 \_\_\_\_\_

Boccio 10.9.21 - Another Perturbation with 2 Spins

Boccio 10.9.47 - Hydrogen Corrections on 2s and 2p Levels

Presentation #4 \_\_\_\_\_

Boccio 10.9.23 - Hydrogen in electric and magnetic fields

Boccio 10.9.34 - Variational Method 4

Presentation #5 \_\_\_\_\_

Boccio 10.9.24 - n=3 Stark effect in Hydrogen

Boccio 10.9.50 - More Perturbation Practice

Presentation #6 \_\_\_\_\_

Boccio 10.9.27 - 2-Particle Ground State Energy

Boccio 10.9.29 - Hyperfine Interaction in the Hydrogen Atom

### Final Problem #1 - Only consult with Professor

Boccio 10.9.26 - Stark Shift in Hydrogen with Fine Structure (solution written up in LaTeX)