

Physics 113 Quantum Theory Seminar

Assignment 6 February 21,22, 2011

This week we apply the quantum formalism to 1-dimensional systems

Part 1: Readings

Zettili - Chapter 4

Boccio - Chapter 8(Pages 544-641 Sections 8.2-8.13).

This material covers a lot of pages, but you have seen about half of it before (Physics 14).

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 understand do all of these problems.

Random choice of presenter.

1. Boccio 8.15.1 Delta function in a well
2. Boccio 8.15.2 Properties of the wave function
3. Boccio 8.15.9 Matrix Elements for Harmonic Oscillator
4. Boccio 8.15.21 Another oscillator
5. Boccio 8.15.30 Things about a particle in a box
6. Boccio 8.15.40 Is it in the ground state?

Part 3: Extra Problems - Presentations

One seminar member has overall responsibility for two problem solutions and their presentation in seminar

Look at/try to solve other problems besides your own responsibility.
You will not understand other solutions without attempting at least thinking about the problem before seminar.

Quality/correctness of presentation = part of seminar grade.

Presentation #1 _____

Boccio 8.15.3 Repulsive Potential

Boccio 8.15.13 Coherent States

Presentation #2 _____

Boccio 8.15.4 Step and Delta Functions

Boccio 8.15.16 Aharonov-Bohm experiment

Presentation #3 _____

Boccio 8.15.5 Atomic Model

Boccio 8.15.18 Eigenstates using Coherent States

Presentation #4 _____

Boccio 8.15.7 $1/x$ potential

Boccio 8.15.19 Bogoliubov Transformation

Presentation #5 _____

Boccio 8.15.10 A matrix element

Boccio 8.15.23 Neutrino Oscillations

Presentation #6 _____

Boccio 8.15.12 Instantaneous Force

Boccio 8.15.26 What is the oscillator doing?

Midterm Problem #3 - Only consult with Professor

Boccio 8.15.22 The coherent state (solution written up in LaTeX)