

# Physics 113 Quantum Theory Seminar

## Assignment 4 February 07,08, 2011

This week we develop the quantum formalism.

### Part 1: Readings

**Zettili:** Chapter 3(Pages 183-191 Sections 3.7-3.8 + solved problems

**Boccio** - Chapter 6(Pages 394-459 Sections 6.9-6.18 ).

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 these solutions.

Random choice of presenter.

Quality/correctness of presentation = 20% Seminar grade.

1. Boccio 6.19.9 - Operator Properties
2. Boccio 6.19.11(6.19.12) - A Very Useful Identity
3. Boccio 6.19.13 - Another Very Useful Identity
4. Boccio 6.19.14 - Pure to Nonpure?
5. Boccio 6.19.17 - Entanglement and the Purity of a  
Reduced Density Operator
6. Boccio 6.19.19 - Creating Entanglement via Unitary Evolution

## Admonition #1

Doing homework assignments by yourself. Copying off some "smart friend" cheats the other students in the class, and it cheats you and your friend. Identical-looking assignments will be referred to me by the grader. You may discuss general physics principles behind the questions with other students -and I encourage you to participate in study groups.

## Admonition #2

Participating in class. Sitting there like a vege while other students think hard and bother to answer questions is parasitic, intellectually. Contribute.

## Part 3: Extra Problems

One seminar member has overall responsibility for each problem.

Solve as many as you can.

Attempting zero beyond your responsibility is NOT an option!

You will not understand solutions without attempting a problem.

Volunteer presenters OK. Never volunteering is NOT an option!

Quality/correctness of presentation = 30% Seminar grade.

1. Boccio 6.19.08 - Scale Transformation \_\_\_\_\_
2. Boccio 6.19.18 - The Controlled-Not Operator \_\_\_\_\_
3. Boccio 6.19.20 - Tensor-Product Bases \_\_\_\_\_
4. Boccio 6.19.21 - Matrix Representations \_\_\_\_\_
5. Boccio 6.19.22 - Practice with Dirac Language  
for Joint Systems \_\_\_\_\_
6. Boccio 6.19.23 - More Mixed States \_\_\_\_\_

## Midterm Problem #1 - Only consult with Professor

Boccio 6.19.10 - An Instantaneous Boost (solution written up in LaTeX)