Physics 471 – Fall 2009

Homework #6, due Friday, October 23

(Point values are in square brackets)

0. [0] Look at Griffiths problem A.1, but we won't grade it. If you have any trouble doing this problem, then talk to a friend or go to office hours. The answers are yes, no, yes. For the "yes" answers, convince yourself that the set of vectors is closed under vector addition and multiplication by scalars. For the "no" answer, think of a counter-example.

1. [2] Griffiths problem A.2. For each part of this problem, if your answer is "yes" then state the dimension of the vector space and suggest a convenient basis.
   Part (d) is optional. We won't grade it, but it's worth looking at for your own edification. Let me suggest the following basis functions: $(x-1)$, $(x-1)^2$, $(x-1)^3$, etc.

2. [4] Griffiths problem A.4. This is the longest problem on this set, but it's not bad if you work slowly and carefully, and keep track of when to use complex conjugates.

3. [2] Griffiths problem A.6.

4. [3] Griffiths problem A.9.
   Part (d) of this problem is optional. We won't grade it. If you are interested, the answer should be in the form of a 3-by-3 matrix! Follow the matrix multiplication rule given by Equation A.40.

5. [3] Do Exercises 1-6 of the last section (Matrices) on the Math Review sheet. We will only grade a subset of these problems, but I want you to do all of them.

6. [3] Griffiths problem A.11. Prove equation A.52 using the rule for matrix multiplication. Then it's easy to prove equations A.53 and A.58 using A.52. Then answer only the first two questions in the problem. You can skip the last two questions. Their answers are, "No, the sum of two unitary matrices is not unitary," and "Yes, the sum of two Hermitian matrices is Hermitian."

7. [3] Choose any problem from the exam that you didn't solve correctly, except problem 3, and do it completely and correctly. If you got a perfect 20/20 on the exam, say that on your homework and skip this problem.