PH 651 Quantum Mechanics 7 October 2015

Homework 2

Due Wednesday 21 October

1. 4.2.1, p. 129 from Shankar

2. 2.23, p. 66 from McIntyre:

Consider a three dimensional ket space. In the basis defined by three orthogonal kets $|1\rangle$, $|2\rangle$, and $|3\rangle$, the operators A and B are represented by

$$A \doteq \begin{pmatrix} a_1 & 0 & 0 \\ 0 & a_2 & 0 \\ 0 & 0 & a_3 \end{pmatrix} \qquad B \doteq \begin{pmatrix} b_1 & 0 & 0 \\ 0 & 0 & b_2 \\ 0 & b_2 & 0 \end{pmatrix},$$

where all the quantities are real.

a) Do the operators A and B commute?

b) Find the eigenvalues and normalized eigenvectors of both operators.

c) Assume the system is initially in the state $|2\rangle$. Then the observable corresponding to the operator B is measured. What are the possible results of this measurement and the probabilities of each result? After this measurement, the observable corresponding to the operator A is measured. What are the possible results of this measurement and the probabilities of each result?

d) How are questions (a) and (c) above related?