

## Physics 621 Homework Assignment 3

due Tuesday September 29 2008

Unless otherwise indicated, the problems are from the textbook (Merzbacher, 3rd edition).

1. Exercise 3.19 (page 45) *Note:* the problem should state that the two solutions are degenerate...
2. Problem 3.1 (page 49). *Hint:* to show that a quantity has no cross-terms, it is sufficient to show that its divergence has no cross-terms...
3. Problem 3.3 (page 49). *Note:* Despite the statement in the problem, you do not need to use the virial theorem to solve this problem. Also, there is a typo in the problem: the result for a) reduces, in the limit of  $\omega \rightarrow 0$  to the result of problem 3.2, not problem 3.1.
4. Exercise 4.6 (page 62)
5. Given two operators  $C$  and  $D$  that do not commute, and neither of which involve explicit time dependence, show that if both  $C$  and  $D$  commute with the Hamiltonian, then the energy eigenstates are, in general, degenerate. Are exceptions to this possible? Discuss...