PHY-851 QUANTUM MECHANICS I

Homework 7, 40 points

October 15 - 23, 2003

Motion of wave packets, Ehrenfest theorems.

Reading: *Messiah*, Chapter II, Sec. I; Chapter IV, Sec. IV; Chapter VI, Sec. I; Chapter 8, §§1-14.

1. /6/ *Messiah*, Problem 1, p. 241.

2. /6/ *Messiah*, Problem 2a, p. 242.

3. /6/ *Messiah*, Problem 3, p. 243.

4. /12/ *Messiah*, Problem 4, p.243.
   /The classical statistical distribution function $f(\mathbf{R}, \mathbf{P}, t)$ of non-interacting particles satisfies a kinetic equation

$$\frac{\partial f}{\partial t} + \frac{\partial f}{\partial \mathbf{R}}\mathbf{v} + \frac{\partial f}{\partial \mathbf{P}}\mathbf{F} = 0, \tag{1}$$

   where $\mathbf{v} = \mathbf{P}/m$ is the velocity of the particle with momentum $\mathbf{P}$, and $\mathbf{F}$ is an external force at a given point $\mathbf{R}$. This equation expresses a simple fact that particles are independently moving along classical trajectories./