Quiz 6 Your Name:

15 minutes; Gey-Hong Sam Gweon, Phys 139A, UC Santa Cruz, Spring 2008

1. [5 points] Which of the following statements is *not always true* for the wave function $\Psi(x) = C\exp(-(x-\lambda A)^2/A^2)$, where $\lambda = \lambda_R + i\lambda_I$ is a *complex* number, $A > 0$, and C is a normalization constant?

   (a) The uncertainty Δx is independent of λ_R and λ_I.

   (b) $\langle\hat{p}\rangle \propto \lambda_I$

   (c) $\langle\hat{x}\rangle = \lambda A$

   (d) $\Delta x \Delta p = \hbar/2$

2. [5 points] From the equation $\frac{d}{dt}\langle\hat{O}\rangle = \frac{i}{\hbar}\langle[\hat{H},\hat{O}]\rangle + \langle\frac{\partial\hat{O}}{\partial t}\rangle$, conservation principles can be discussed. When is the energy conserved for a QM system?

3. [5 points] Regarding the equation $\frac{d}{dt}\langle\hat{O}\rangle = \frac{i}{\hbar}\langle[\hat{H},\hat{O}]\rangle + \langle\frac{\partial\hat{O}}{\partial t}\rangle$, which of the following statements is *not true* ?

   (a) It holds for any state $\Psi(x,t)$.

   (b) It holds for any $\hat{H}$.

   (c) It holds for any $\hat{O}$.

   (d) It holds only when $\hat{O}$ is Hermitian.