Homework #1 for Physics 371

Due Friday, January 22 (by 4pm in the blue box outside PAS 220)

1) Problem 1.3, Griffiths.

2) Minimum energy of a harmonic oscillator

The energy of a simple harmonic oscillator is

$$E = \frac{p_x^2}{2m} + \frac{m\omega^2 x^2}{2},$$

where ω is the natural frequency. Use the uncertainty principle

$$\Delta x \Delta p_x \geq \hbar/2$$

to estimate the minimum (average) energy $\langle E \rangle$ of the oscillator. Assume that the minimum energy state is such that $\langle p_x \rangle = 0 = \langle x \rangle$, so that $\Delta p_x^2 = \langle p_x^2 \rangle$ and $\Delta x^2 = \langle x^2 \rangle$.