

**Quiz on Chapter 1** : Test your knowledge of concepts from chapter 1 (also includes stuff from lectures I gave while we read chapter 1, but which may not be in the book).

This is supposed to be a quick check of how familiar you are with concepts from this chapter. You should be aiming to know the material in the course well enough, that by the time the exam comes, none of these questions takes more 30 seconds to answer. These are the basic facts you shouldn't be spending time trying to remember, so that you have more time to concentrate on the actual problem solving. Note: I definitely do not recommend that you "memorize" the answers to these questions—that would miss the point. These are only some examples of key concepts anyway. Rather, you should have the studied the material to the point that you *know* this stuff, without explicitly having memorized it.

1. Write down the relations between energy and frequency, and between momentum and wavelength, that we use in quantum mechanics.
2. Write down the Schrodinger equation for 1 particle (no spin) in one dimension with potential  $V(x)$
3. What is the dispersion relation for plane waves representing a free particle in one dimension, that is, the  $\omega$  versus  $k$  relation?
4. If a plane wave in one dimension is written  $\psi(x) = \exp(i(kx - \omega t))$ , what is the phase velocity of the wave? (That is, if you think about a point of constant phase, such as a peak in the real part, what is its velocity).
5. If  $\rho(x)$  is a probability distribution for  $x$ , write down expressions (as integrals over  $x$ ) for the mean value and variance of  $x$ , and the mean value of a function  $f(x)$ .

6. Write down the differential form of the momentum operator in one dimension.