Assignment 7
PH462
Due August 2

1. Read sections 5.1, 5.2, 5.3, 5.4, 5.5
2. Chapter 1 Griffiths: problem 1.60 part d.
3. Chapter 5 Fowles: problems 1, 2, 7, 8, 16
4. Using Huygen's Principle construct an animated Mathematica model for a wave travelling through a single slit. Let the aperture size be twice the wavelength. Use the free space dispersion relation for an EM wave.
5. Using Mathematica (a) animate both the wavefunction and probability density of a localized particle (whose position uncertainty is less than the well separation) bouncing back and forth in an infinite well. Use the Schrödinger dispersion relation. (b) What happens if you increase the mean value of the quantum number "n" for the superposed wavefunctions? (c) Tabulate the expectation value of the position as a function of time for one round trip. Use at most 5 wavefunctions in the superposition. Please put in the document you hand in a single plot from parts (a) and (b) and the table from (c).
6. Using Mathematica animate the wavefunction for a particle incident upon a potential barrier with $E = 3U_0/4$. Use the Schrödinger dispersion relation. Make sure the incident, reflected, and transmitted waves (both in the barrier and to the right of it) are plotted. Does your solution match the boundary conditions for all times chosen in your animation?