Physics 462, Summer 2006

Homework 3 due at the beginning of class July 11

1. Extend our discussion in class to show that Faraday's and Ampere's laws are both satisfied for a plane EM wave.

2. Use the Schrodinger dispersion relation for two (or more) harmonic waves with slightly different momentum. Add these two (or more) waves to make a wavegroup. Using Mathematica animate the motion of the wavegroup. Does a wavecrest move through the wavegroup, or the wavegroup move through the wavecrest, or do both move at the same speed? Submit your code with output deleted.

3. The vector potential for a uniform magnetostatic field is $\mathbf{A} = -(\mathbf{r} \times \mathbf{B})/2$ (see the chapter on magnetostatics). Show that $d\mathbf{A}/dt = -(\mathbf{v} \times \mathbf{B})/2$, in this case, and confirm that the equation for the time derivative of the canonical momentum (see the class notes) yields the correct equation of motion.

4. Griffiths: Chapter 9: problems 3, 4, 5, 7, 9, 11, 12.

5. Read the sections on polarization in chapter 2 of Fowles and do problems 2.11 and 2.13.