

## Electricity and Magnetism II (PHY 322)

### 1D EM Wave Animation Homework

This homework is all about animating EM waves in one spatial dimension. We focus on the “TE mode”, in which the wave travels (or changes) in the  $x$  direction, the electric field points in the  $y$  direction, and the magnetic field points in the  $z$  direction. There is a basic traveling wave that has these properties, but we are not restricting our attention to traveling waves. We can make standing waves as well as waves produced by a changing current density. Download the file `EMWave1DTE.hs` from the course website.

**Problem 1** (4 points) The file `EMWave1DTE.hs` has an example of a standing EM wave in which three half-wavelengths fit across the region we are keeping track of. Make a standing EM wave in which five half-wavelengths fit across the region we are keeping track of.

**Problem 2** (4 points) The file `EMWave1DTE.hs` has an example of a wave produced by an oscillating current density. Change the current density to a single pulse of some shape and animate the resulting wave.

**Problem 3** (4 points) The file `EMWave1DTE.hs` has an example of a wave produced by an oscillating current density in the middle of the region we are studying. Change this to a current density that oscillates the same way in time, but at two locations separated by half of a wavelength. You should be able to see some interference effect.

**Problem 4** (4 points) The file `EMWave1DTE.hs` has an example of a wave produced by an oscillating current density in the middle of the region we are studying. Change this to a current density that oscillates the same way in time, but at two locations separated by a whole wavelength.