Math 335-002
Homework #20
Problems 1-4 due April 16; problem 5 due April 18, 2007

1. Consider two point charges located at Cartesian points (0,1,0) and (1,0,0), with electric charges equal to Q and 2Q, respectively. Find the potential and the electric field at point (1,1,0) using the superposition principle ($\Phi=\Phi_1+\Phi_2$, $\boldsymbol{E=E_1+E_2}$).

2. Consider an electromagnetic wave propagating in the z-direction, with the electric field polarized in the y-direction: $\vec{\mathbf{E}}=\vec{\mathbf{E}}(y)=\{0, A \cos(k\,z - \omega t), 0\}$, where A is a constant wave amplitude, k is the wave number, and $\omega = k\,c$ is the angular frequency. Show that $\vec{\mathbf{E}}$ satisfies the wave equation. Calculate the corresponding magnetic field $\vec{\mathbf{B}}$ by calculating $\vec{\nabla}\times\vec{\mathbf{E}}$ and then integrating with respect to time, as we did in class: $\vec{\mathbf{B}} = \int \vec{\nabla}\times\vec{\mathbf{E}}\ dt$

3. The New York public radio broadcasts on the frequency $f=94$ MHz. What is the wavelength of the radiowaves produced by the radio station?

4. Problems 8.2, 8.4, and 8.6 on pp. 139-140