

Set #1

Due Wednesday January 27, 2016 at 12:15pm

Make note of the following:

- Please write on only one side of the paper
- Do your own work, I am OK with study groups, but you need to understand what you are doing
- I may occasionally assign bonus problems
- I will allow overflow on you homework average, if you should do really well on homework throughout the semester

Problems:

1. A point charge of $q_1 = 2\text{ C}$ is placed in (x, y, z) coordinates at $(0, 0, 0)$. Assume free space.
 - a.) At radial distance $R = 3\text{ m}$, where $R = (x^2 + y^2 + z^2)^{1/2}$ what is the electric field intensity magnitude, $|\mathbf{E}| = E$, in V/m.
 - b.) A second charge, $q_2 = 5\text{ C}$ is moved to location $(x, y, z) = (1, 3, 7)\text{ m}$. What is the magnitude of the force between the two charges. Since I said magnitude, there is no need to worry about the unit vector \mathbf{R}_{12} . Your units should be newtons (N).
 - c.) Repeat (a) assuming a medium having $\epsilon_r = 4.7$.
 - d.) For part (c) find the corresponding electric flux density in C/m^2 .
2. Plot the magnetic flux density magnitude, $|\mathbf{B}| = B$, versus the radial distance r in the (x, y) plane, assuming a wire along the z axis is carrying a current of 5 A . Assume $\mu_r = 1$. Let r vary between 0.1 and 10 m . The units should be tesla (T).
3. Ulaby text 1.1. Answer in the book, but you need to show your work.
4. Ulaby text 1.8. Answer to part (a) in the book, but you need to justify. For the remaining parts you probably want to do some plotting in Python or MATLAB or Mathematica to see more clearly what is going on.
5. Ulaby text 1.11 for 10 bonus points.