Assignment 3
PHGN361

If you got a 6 or lower on the first and/or third exam problems then you need to set up a time to see me. I will ask you to explain the solution to a very similar problem. You can practice on the problems posted in old exams on the wiki and/or the previous homework or that assigned for chapter 1 below.

Homework due Feb. 10

1. Chapter 1 problems 55, 58, 60 (c).

2. A measurement of the electric field near the ground yields a value $-100\hat{y}$ N/C. A measurement at $y = 10$ m yields $-90\hat{y}$ V/m. Assume the field points perpendicular to the earth. What is the charge density in atmosphere (assume it is uniform).

3. Chapter 2 problems 43(PMC)

4. Chapter 3 problems 2, 3(PMC), 7

5. Use Excel to numerically solve Laplace's equation using the relaxation method. Choose a 20 by 20 rectangular grid. On the outside perimeter let the voltage be zero. On a 5 by 5 rectangular grid somewhere in the interior let the voltage be 100.

   In the cell where the voltage isn't fixed an equation needs to be inserted. Choose the upper left cell and insert the equation with the syntax equal sign followed by the equation. To have this equation appropriately adjusted for the other cells first outline the cell into which you want the formula to be inserted, then go to edit, choose fill and then fill right (or down). By clicking on a another cell you can check if the formula has been appropriately inserted.

   The spreadsheet automatically iterates through the formulas you create in the cells. However, if the formula is circular (changes values depending upon the previous iteration) then the software spits out an error message. To avoid this you need to turn off the default iteration. This is done by clicking on tools then options then calculations then click on manual then iteration and set the iteration to one. Click on OK. Now to iterate you just press f9. Watch the numbers in the cells change for each iteration. Then graph this array using 3-D plot. Watch how the plot changes for each iteration.

   In OpenOffice go to tools, options, OpenOffice.org calc, calculate, then enable iterations and set iterate step to 1 and minimum change to 100. Press control shift F9 to iterate the calculation.