Computer Home Assignment

Weeks 01 to 03

Due on Crowdmark as per Syllabus' Table. Total points: **100**.

HA submission instructions:

- Please, submit the answer to each question starting on a separate page.
- Write as clearly and legibly as you can.
- Use a black pen to ensure good contrast.
- Avoid using a flash when taking a picture, which should be taken in good light.
- Use only one side of the paper, to ensure there is no bleeding through from the other side.
- You can either handwrite or typeset your solution.

HA 3.1 Electrostatic Field of Disk Everywhere in Space [50 points]

Find the electrostatic field of a uniformly charged disk at any point in space. The disk has radius R and constant surface charge density σ; additionally, the disk is infinitesimally thin. You should solve the problem by writing a code, e.g., in MATLAB or Python.

1. Write the solution to the problem in integral form by means of Coulomb's law and the superposition principle. [10 points]
2. Write the code associated with the integral. Report your code in your solution. [10 points]
3. Check the convergence of your code choosing at least two suitable observation points. [10 points]
4. Compare your numerical result with the analytical solution along the disk's axis. [10 points]
5. Show a few suitable plots clearly showing the circular symmetry of the problem. [10 points]

HA 3.2 Electrostatic Field of Rectangle Everywhere in Space [50 points]

Find the electrostatic field of a uniformly charged rectangle at any point in space. The rectangle has sides with length a and b, respectively, and constant surface charge density σ; additionally, the rectangle is infinitesimally thin. You should solve the problem by writing a code, e.g., in MATLAB or Python.

1. Write the solution to the problem in integral form by means of Coulomb's law and the superposition principle. [10 points]
2. Write the code associated with the integral. Report your code in your solution. [10 points]
3. Check the convergence of your code choosing at least two suitable observation points. [10 points]
4. At a suitable point of your choice, compare your numerical result with the analytical solution for an infinite plane of charge. [10 points]
5. Show a few suitable plots clearly showing the field at the enges of the rectangle. [10 points]