PHYS 380 Online Evaluation 2, 15August 2020, 14:00-15:30

Please submit your answers as a **SINGLE PDF FILE** named with **YOUR TRUE NAME** to

metin.arik@boun.edu.tr and to **arik.metin@gmail.com**

Before 15:30

1. The three dimensional Dirac delta function satisfies the differential equation
$$\Delta \frac{1}{|\vec{r} - \vec{r}'|} = -4\pi\delta(\vec{r} - \vec{r}')$$
Explain how this equation is related to Maxwell's equations and to the formula $V(\vec{r}) = 1/4\pi\varepsilon_0|\vec{r} - \vec{r}'|$ which gives the electric potential of a point charge.

2. An infinite slab of thickness 2a lies along the xy plane from z=-a to z=a and carries volume charge density ρ. Calculate the electric field and the electric potential as a function of z.

3. A line charge along the x-axis lies from x=-a to x=a. The charge distribution on it is given by $\lambda = \lambda_0|x|$.
(a) Find the total charge.
(b) Calculate the potential V(x) at all points x. Express your result neatly.
(c) Plot V(x) as a function of x.

4. Four concentric metal spherical sheets with radii a, 2a, 3a, 4a each have charqe Q on them.
(a) Find the potential of each spherical sheet.
(b) If the innermost sphere is qrounded, make a list showing the charge and potential of each spherical sheet.

5. A wire has length L, radius r, resistance R and carries current I . Calculate the electric field inside the wire in terms of these given quantities.