

January 23, 2013

PHY 712 – Problem Set #3

Continue reading Chapter 1 & 2 in **Jackson**; homework is due Friday Jan. 25, 2013.

1. Consider a one-dimensional charge distribution of the form:

$$\rho(x) = \begin{cases} 0 & \text{for } x < -a/2 \\ \rho_0 x/a & \text{for } -a/2 \leq x \leq a/2 \\ 0 & \text{for } x > a/2, \end{cases}$$

where ρ_0 and a are constants.

- (a) Solve the Poisson equation for the electrostatic potential $\Phi(x)$ with the boundary conditions $\frac{d\Phi}{dx}(-a/2) = 0$ and $\frac{d\Phi}{dx}(a/2) = 0$.
- (b) Find the corresponding electrostatic field $E(x)$.
- (c) Plot $\Phi(x)$ and $E(x)$.
- (d) Discuss your results in terms of elementary Gauss's Law arguments.