

**PHY 712 – Problem Set #3**

Continue reading Chapter 1 & 2 in **Jackson**

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  $\rho_0$  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.