Continued reading Chapter 1 - 3 in Jackson; homework is due Friday Jan. 21, 2011.

1. Consider a one-dimensional charge distribution of the same form considered in HW2:

\[
\rho(x) = \begin{cases} 
0 & \text{for } x \leq -a/2 \\
\rho_0 x/a & \text{for } -a/2 \leq x \leq a/2 \\
0 & \text{for } x \geq a/2,
\end{cases}
\]

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 \( \frac{d\Phi}{dx}(a/2) = 0 \) using the appropriate Green’s function derived from an orthogonal function expansion as discussed in Lecture Notes #3.

(b) Compare your results for the potential with the results obtained using the Green’s function \( G(x, x') = 4\pi x_\lt \), also considering the convergence with increasing numbers of expansion terms.