Physics 212: Fall 2016

Homework 2

1. Find the Green’s function for the one dimensional differential equation

\[ \frac{d^4 y}{dx^4} = f(x) \quad 0 < x < L \]  

with boundary conditions \( y(0) = y'(0) = y''(L) = y'''(L) = 0 \).

2. Find the electric field inside a conducting spherical shell of radius \( R \) that has a point dipole \( \mathbf{p} \) at the origin. (For definiteness, you can assume that the sphere is grounded, but this is not necessary.) Do this in two different ways:
   i) By considering the image charges of two point charges \( \pm q \) whose midpoint is at the center of the sphere and whose separation \( \delta \) is infinitesimal, with \( q\delta \) held constant
   ii) By considering the electric potential \( \varphi_0 \) on the surface of the sphere due to the dipole by itself, and then solving Laplace’s equation inside the sphere with the boundary condition that the potential on the surface of the sphere must be \( -\varphi_0 \).

Zangwill 8.12 a), b) and c).

Zangwill 8.19 a) and b).

Zangwill 8.20