4^{th} Homework
Due October 30, 2009

1. Consider a unit point charge placed inside a cube of side length L with conducting walls. Choose a coordinate axis such that one corner of the cube is at the origin and three sides are on the positive x, y and z axis. Assume that the charge is located at the point with coordinate (x_0, y_0, z_0). Calculate the electric field inside the cube. (*Hint:* The Dirac delta function in the cube can be expanded (anti)periodically in the cube in terms of sines/cosines)

2. Solve the previous problem for a sphere of radius R instead of a cube. What is the charge density? (Set the electrostatic potential of the surface to zero.). At the end of your calculation, set $R \to \infty$. What is does your solution become? (*Hint:* To simplify the solution, you can chose orient your coordinate axis such that the point charge lies on the z-axis.