

# Electrodynamics (PHY 514) : 2006

## Assignment 3 :

This problem set is due **Thursday January 19**, at the end of the lecture. Feel free to discuss the problems with others in the class, but you must write your own solutions. Simply writing the answer without showing a derivation will obtain zero credit.

1. Consider a two-dimensional rectangular cavity, with sides of length  $a$  and  $b$ . The sides at  $y = 0$  and  $y = b$  are held at potential  $V_0$ . The side at  $x = 0$  is held at potential  $V_1$ , while the electric field at  $x = a$  vanishes. What is the potential everywhere inside the cavity.
2. Two identical charges  $+q$  are placed a distance  $b = 2$  m apart. A grounded conducting sphere of radius  $a$ , with  $a < b$ , is placed equidistant between them. Find  $a$  such that there is no force on either charge. Compare this with the value obtained from an approximate expression obtained for  $a \ll b$ .
3. Consider a conducting sphere of radius  $a$  located at the origin. A charge  $+q$  is located at  $z = c$ . The system is immersed in a uniform electric field in the  $+z$ -direction. Find the charge  $Q$  of the sphere in order for there to be no net force on the charge  $+q$ .
4. Problem 2.26 Jackson
5. Problem 2.27 Jackson