1. **Given a region of space in which the electric field is everywhere directed parallel to the x axis. Prove that the electric field is independent of the y and the z co-ordinates.**

2. **The plane $x = 0$ has a constant surface charge density σ_1 and the plane $x = a$ has a constant charge density σ_2. Find the electric field in the three regions $x < 0, \quad 0 < x < a$ and $x > a$.**

3. **A point charge q is placed a distance d in front of an infinite grounded conducting plane.**
   (a) **Find the force acting on the plane.**
   (b) **What is the electrostatic energy stored in this configuration?**

4. **A point charge q is placed a distance a from the center of a grounded conducting sphere of radius $R, \quad a > R$.**
   (a) **In the method of images find the quantity and the position of the image charge. Justify that this image charge makes the potential of the whole conductor 0.**
   (b) **Find the force of attraction between the point charge and the sphere.**
   (c) **If the sphere was not grounded, what would be the potential of the sphere when the charge q is placed at the distance a from the center of the sphere?**
   (d) **Get the potential of the ungrounded sphere in part (c) using the meanvalue theorem.**

5. **A uniform line charge with linear charge density λ and parallel to the y axis is placed in front of the an infinite grounded yz plane parallel to the line at a distance d. Find the potential at all points $x > 0$.**

6. Two infinitely long straight wires carrying a uniform line charge density λ and $-\lambda$ are separated by distance 2b (refer Figure 1). An infinitely long cylinder with radius a is placed in between the two wires with its center being at the mid point of the line segment representing their separation. Find the electric potential everywhere outside the cylinder.