1. **Which of the following can be an electrostatic field?**
   (a) $x\hat{\mathbf{i}}$**,** **(b)** $y\hat{\mathbf{i}}$**,** **(c)** $(1/r)\hat{\theta}$**,** **(d)** $(1/s)\hat{\phi}$

2. **A sphere of radius** a **is maintained at a uniform potential** V_0**. Find the potential both, inside and outside the sphere.**

3. **A very long cylinder of radius** a **has a uniform surface charge of density** σ**. Find the electric potential both inside and outside the cylinder by solving the Laplace's Equation in the chargeless regions.**

4. **Two infinitely long wires running parallel to the** x **axis carry uniform charge densities** $+\lambda$ **and** $-\lambda$**.**
   (a) Find the potential at any point using the origin as the reference.
   (b) Show that the equipotential surfaces are circular cylinders. Locate the axis and radius of the cylinder corresponding to a given potential V_0**.**

5. **An infinite plane has a uniform charge with surface density** σ**. Solve the Laplace's Eqn on the two sides of the plane and evaluate the electric field using the boundary conditions on the fields at the interface.**

6. **A chargeless region is bounded by two conducting surfaces.**

   (a) **If conductor 1 is maintained at potential** V_1 **and 2 is grounded the potential in the region is given by the function** $\Phi_1(x, y, z)$**. If conductor 2 is maintained at potential** V_2 **and 1 is grounded the potential in the region is given by the function** $\Phi_2(x, y, z)$**. Now if conductor 1 is maintained at potential** V_1 **and conductor 2 is maintained at potential** V_2 **prove that the potential in the region will be given by the function** $\Phi = \Phi_1 + \Phi_2$**.**

(b) **If a charge Q_1 is placed on conductor 1 while 2 is chargeless the potential in the region is given by the function $\Phi_1(x, y, z)$. If a charge Q_2 is placed on conductor 2 while 1 is chargeless the potential in the region is given by the function $\Phi_2(x, y, z)$.**
Now if charge Q_1 is placed on conductor 1 and charge Q_2 is placed on 2 prove that the potential in the region will be given by the function $\Phi = \Phi_1 + \Phi_2$.

This result can be extended to a region bounded by any number of conductors.