1. **Starting from the defination of a Coulomb of charge in the M.K.S system and an e.s.u of charge in the C.G.S system determine how much e.s.u of charge make one coulomb of charge.**

2. **If $\vec{\mathbf{E}} = kr^3\hat{\mathbf{r}}$ in a region find the charge density in the region.**

3. **A hollow spherical shell carries a charge density $\rho = k/r^2$ in the region $a \leq r \leq b$. Find the electric field in the three regions , $r < a, \quad a < r < b, \quad r > b$.**
   Try to do this also using the differential form of Gauss's Law.

4. **A spherically symmetric charge distribution is given as $\rho = \rho_0$ for $r \leq a$ and $\rho = 0$ for $r > a$. In addition a point charge q is placed at the origin. Find the electric field in the region using the differntial form of Gauss's law.**

5. **Two infinite parallel planes carry equal but opposite uniform charge densities $\pm\sigma$. Find the electric field in the three regions, into which the planes partition the space.**

6. **The electric field in a region is cylindrically symmetric, given as follows:**

$$\begin{aligned}\vec{\mathbf{E}}(\vec{\mathbf{r}}) &= \frac{c}{s}\hat{s}; \quad \textbf{when} \quad s \geq a \\ &= \frac{cs}{a^2}\hat{s}; \quad \textbf{when} \quad s < a\end{aligned}$$

   Find the charge distribution in the region using Gauss' law.

7. **The coulomb's law of forces between two point charges and the Gauss's law of electrostatics are equivalent. Starting from the Coulomb's law derive the Gauss's law. Start with the electric field due to a point charge q at the origin given according to**

Coulomb's law as $\vec{E}(\vec{r}) = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}\hat{r}$.