1. **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.**
2. **A conducting sphere of radius R has an amount of charge Q over it. This sphere is placed in an otherwise uniform electric field $\vec{E}_0$. Find the potential in the region outside the sphere.**
3. **A sphere of radius R has a surface charge given by the surface charge density $\sigma = k \cos 3\theta$ where k is a constant. Find the potential inside and outside the sphere.**
4. **The potential on the axis of a uniformly charged disk of radius R is given as**
$$V(r, 0) = \frac{\sigma}{2\epsilon_0}(\sqrt{r^2 + R^2} - r)$$
Use this together with the fact that $P_l(1) = 1$, to evaluate the first three terms in the expansion of the potential function at points off the axis assuming $r > R$.
5. **Solve Laplace's equation by separation of variables in cylindrical co-ordinates, assuming there is no dependence on z.**