1. Find three first terms of the electrostatic potential expansion in terms of Legendre polynomials for a system of 2 charges, \(-q\) located at \(z = -a\) and \(q\) located at \(z = a\) .

2. Develop the electrostatic potential for a linear electric quadrupole: charge \(q\) located at \(z = -a\) , charge \(q\) located at \(z = a\) , and charge \(-2q\) located at \(z = 0\) .

3. Prove that \(P_n'(1) = \frac{1}{2}n(n+1)\).

4. Consider a sphere with the potential on its surface \(r = a\) maintained at \(V(a, \theta, \phi) = V_0 \cos^3(\theta)\). By solving the Laplace equation, find the potential distribution in space.

5. Consider a sphere with the potential on its surface \(r = a\) maintained at \(V(a, \theta, \phi) = V_0 \cos^3(\theta)\cos^2(\phi)\). By solving the Laplace equation, find the potential distribution in space.