TFY 4240

Øving 4 2006

Problem 1

The potential on a sphere of radius R is given by

$$V(R,\theta) = V_0 \cos^2\theta$$

a) Show that the potential outside the sphere is given by

$$V(r,\theta) = \frac{1}{3}V_0\left[\frac{R}{r} + 2\left(\frac{R}{r}\right)^3 P_2(\cos\theta)\right]; \qquad r > R$$

Hint : Follow the same procedure as in equations 3.70, 3.71 in the textbook, i.e. write $\cos^2\theta$ as a sum of Legendre polynomials and use the orthogonality relations for the polynomials.

b) Find the surface charge distribution on the sphere.

c) Integrate over the surface charge to find the quadrupole moment of the sphere. Check to see that this agrees with the l=2 term in the potential outside the sphere.

Problem 2

Problem 4.14 in Griffiths.

Problem 3

Problem 4..21 in Griffiths.

Problem 4

Problem 4.30 in Griffiths