Theoretische Physik 2 (Elektrodynamik)
Wintersemester 2016/17

Abgabe bis Freitag, 09.12.16, 12:00 neben PH 3218.
Übungsblatt Nr. 7   Dieses Blatt wird in den Übungen vom 12.12. - 16.12.16 besprochen.

Aufgabe 1:
The potential outside of a sphere with boundary conditions   **3 Punkte**

Calculate the potential outside of a sphere of radius R that is cut into two halves that are maintained at opposite potential $\pm$ V.

Hint: The inside potential has been calculated in the lecture.

Aufgabe 2:
A conducting spherical shell in a uniform field   **7 Punkte**

Two concentric spheres have radii a, b ($b > a$), and each is divided into two hemispheres by the same horizontal plane. The upper hemisphere of the inner sphere and the lower hemisphere of the outer sphere are maintained at potential V. The other hemispheres are at zero potential. Determine the potential in the region $a \le r \le b$ as a series in Legendre polynomials. Include terms at least up to $l = 3$. Check your solutions against known results in the limiting cases $b \to \infty$, and $a \to 0$, respectively.

Hint: In both exercises, you may need to calculate $\int_0^1 \mathcal{P}_l(x)\,dx$. You may do it by first integrating the generating function

$$\frac{1}{\sqrt{1 - 2xt + t^2}} = \sum_{l=0}^{\infty} \mathcal{P}_l(x)\,t^l$$

from $x = 0$ to 1 in both sides. After that, you can expand the result in series of t and identify the coefficients of t^l.