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Course of Physics 2: Electricity

1st year Bachelor's degree mathematics and computer science

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Home work 1

Exercice1 :

A sphere with center O and radius R contains a uniformly distributed charge with a density of volume ρ.

1- Find the expression of the electric field E(r) by applying GAUSS's theorem.

2- Deduct the electric potential V (r).

Exercice2 :

Consider a sphere of radius R with a charge Q uniformly distributed over its surface with a density σ.

1- Applying the GAUSS theorem, calculate the electric field at any point in space.

2- Deduct the electric potential at any point in space.

Exercice 3:

Let be two concentric spheres of center O of respective radius R_1 and R_2 such that $R_1 < R_2$. The sphere of radius R_1 is surface-charged with a density σ. The second of radius R_2 carries a surface distribution of density σ'

1- Using the GAUSS theorem, find the expression of the electrostatic field E(r) at any point in space.

2- Derive the expression of the electric potential V(r) at any point in space.

Exercice 4:

We consider two infinitely long coaxial cylinders, with radius R_1, R_2 such that $R_1 < R_2$; carrying respective loads +λ and - λ per unit length.

- Find the expression of the electric field at any point in space.

Exercice 5:

Let be two coaxial cylinders of radius R_1 and R_2 such as R_1<R2 and of infinite height. The cylinder of radius R_1 has a surface distribution of density $\sigma_1 = \sigma > 0$. Similarly, the second cylinder of radius R_2 carries a surface distribution of density $\sigma_2 = 2\sigma > 0$

1- Using Gauss's theorem, find the expression for the electrostatic field E(r) at any point in space.

2- Derive the expression of the electric potential V(r) for $r > R_2$.