



Physics 2: Series 3

Gauss's theorem + Conductors

Exercise 1

By using Gauss's theorem:

- 1- Calculate the electric field $\vec{E}$ created at a point M located outside an infinite plane (P) of uniform surface charge density σ ($\sigma > 0$).
- 2- Deduce the field $\vec{E}$ created in M by an infinite plane (P') perpendicular to (P) of uniform charge density 2σ .
- 3- Calculate the field $\vec{E}_T$ resulting at this point.

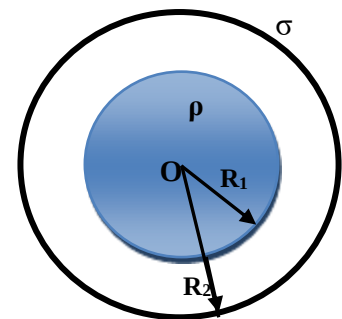


Exercise 2

Consider two concentric spheres of radii R_1 and R_2 ($R_1 < R_2$). The outer sphere of radius R_2 is charged with a surface charge density σ constant and positive, as for the interior sphere of radius R_1 it is charged with a volume charge density ρ constant and positive.

Using Gauss' theorem, determine:

- 1- The electric field $E(r)$ at any point in space.
- 2- The electric potential $V(r)$ at any point in space.



Exercise 3

The cylindrical capacitor consists of two coaxial conducting Cylinders of radii R_1 and R_2 ($R_1 < R_2$), the first carries a positive charge Q and the second carries a negative charge $-Q$.

-Calculate the capacitance of this capacitor.

