UNIVERSITY OF BATNA 2
FACULTY OF TECHNOLOGY

Year University : 2023-2024
common Core Engineer

PHYSICS 2   T 02

Electostatic Field and Potential

Continuous Distribution

Exercise N°1

In the plan xOy, we consider a circular wire with center O, of radius R and axis Oz (Fig1). This wire is uniformly charged with a positive linear density λ.

1. Represent then express the elementary electric field $\boldsymbol{d\vec{E}_M(z)}$ created by an element of length $\boldsymbol{\overrightarrow{dl}}$ of the wire at the point M(0,0,z).
2. Calculate the total field $\boldsymbol{\vec{E}_M(z)}$ created by this distribution.
3. Trace $\boldsymbol{E_M(z)}$, for z ≥ 0.

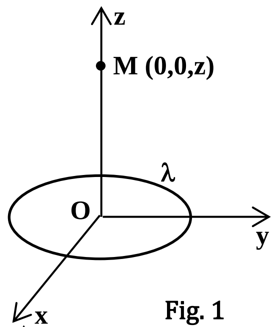


Fig. 1

Exercise N°2 : A ring with center O and radius R carries a uniform linear density of positive charges $\boldsymbol{\lambda}$ except on an arc of angle $2\boldsymbol{\alpha}$

(Figure 2).

- Determine the electrostatic field $\vec{E}$ (O) at point O.

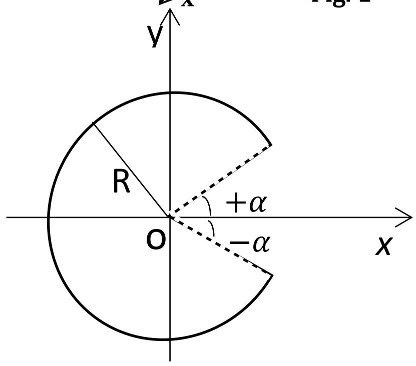


figure 2

Exercise N°3

A circular disk of negligible thickness with center O, radius R, carries a uniform surface density of charge б > 0. 1) Calculate the electric field E created by this charge distribution at a point M placed on the axis of revolution of the disk such that OM=Z. 2) Trace the curve E(Z), What becomes the expression of E when R increases indefinitely.

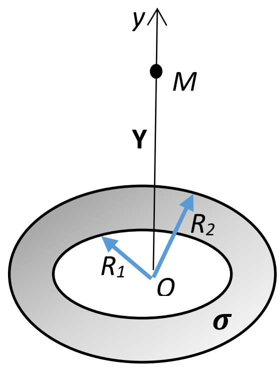
Exercise N°4

A round metal of interior radius $\mathbf{R_1}$ and exterior radius $\mathbf{R_2}$ carries a surface charge of density $\boldsymbol{\sigma}$ distributed uniformly between R_1 et R_2 (figure 3).

(تحمل حلقة معدنية شحنة موزعة بانتظام سطحيا بين القطرين الداخلي $\mathbf{R_1}$ و الخارجي $\mathbf{R_2}$ذات كثافة $\boldsymbol{\sigma}$)

1- Calculate the electrostatic field $\vec{E}$ created by this charge distribution at point M located on the axis of revolution at a distance **Y** from its center O (**OM=Y**).

2- What becomes the expression of the field $\vec{E}$:
  - When $R_1 = 0$. Trace its curve
  - When $R_1 \to 0$ and $R_2 \to \infty$. Trace its curve.



(Figure 3)