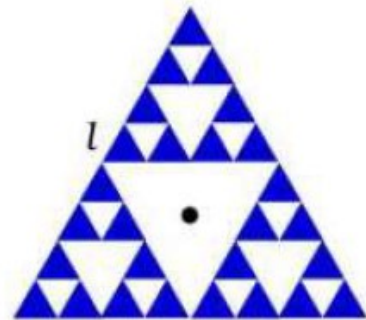


METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH 2 zima24 – Príklady 1

Cvičenie 26.9.2024

Príklad 1

Take an equilateral triangle of side ℓ , and remove the middle triangle ($1/4$ of the area). Then remove the middle triangle from each of the remaining three triangles (as shown), and so on, forever. Let the final object have mass M . Find the moment of inertia of this object, around an axis through its center and perpendicular to its plane.

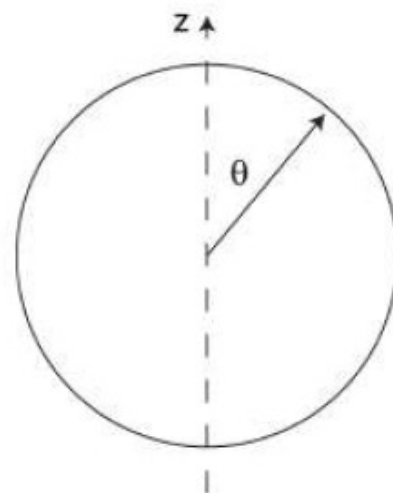


Príklad 2

Consider a sphere of radius R . The potential on the surface of the sphere varies as (see figure below)

$$\phi(\theta) = \phi_0 \cos^2 \theta$$

The region inside and outside the sphere is empty.



- Compute the potential inside and outside of the sphere.
- Compute the electric field inside the sphere.
- Using Gauss' law, show that while the electric field inside the sphere is non-zero, no charge is contained inside the sphere.

Príklad 3

PROBLEM: A long, straight cylindrical wire, of radius a carries a uniformly distributed current I . It emits an electron from $r = a$, with initial, relativistic velocity v_0 parallel to its axis. Find the maximum distance r_{max} from the axis of the wire which the electrons can reach, treating everything relativistically.

Příklad 4

A very long wire of radius a is suspended a distance d above an infinite conducting plane. In the case that $d \gg a$, find approximate expressions for

- The capacitance per unit length of the wire, conducting plane system.
- The surface charge density on the conducting plane as a function of y , the distance along the plane lateral to the wire.

