METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH zima21 – Príklady 3

Cvičenie 19.10.2021

Príklad 1

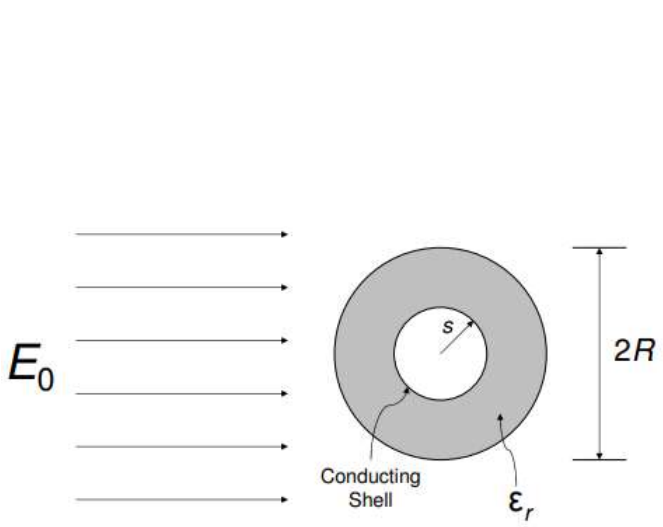
You are driving at a constant speed of $v = 30\ m/s$, always in the NW direction. You are driving on a horizontal sheet of ice on the Arctic Ocean, with coefficient of friction $\mu = 0.1$. At what distance R from the N pole do you start to skid? Take $g = 9.8\ m/s^2$.

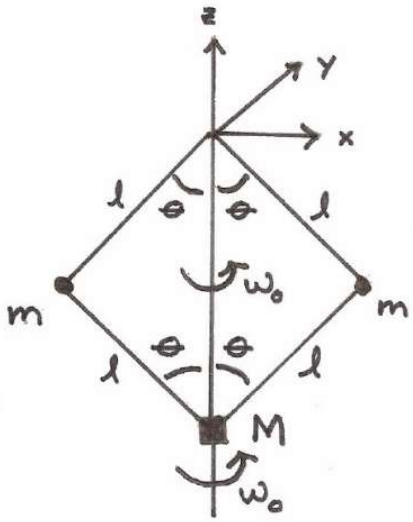
Príklad 2

A dielectric sphere of radius R is hollowed-out in the region $0 \leq r \leq s$ and a thin, grounded, conducting shell inserted at $r = s$. The sphere is placed in a uniform, external $E-$field $E = E_0\hat{z}$ along the z-axis. The dielectric constant is ϵ_r.

(a) Calculate the potential in the region $r \geq R$.

(b) Roughly sketch the polarization and induced charge in the region $r \leq R$.





Príklad 3

A flyball governor consists of two masses m connected to arms of length l and a mass M as shown below. The assembly is constrained to rotate around a shaft on which the mass M can slide up and down without friction. Neglect the mass of the arms, air friction and assume that the diameter of mass M is small. Suppose that the shaft is constrained to rotate at angular velocity ω_0.

(a) Calculate the equilibrium height of the mass M.

(b) Calculate the frequency of small oscillations around this value.