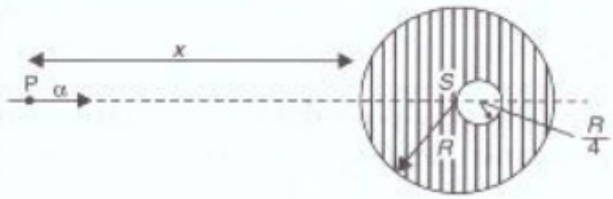
METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH zima21 – Príklady 5

Cvičenie 16.11.2021

Príklad 1

■ Částice o klidové hmotnosti m_0 se pohybuje podél osy x tak, že její poloha v každém okamžiku je dána vztahem $x = \sqrt{a^2 + c^2 t^2} - b$.
Jaká síla přitom působí na částici?

■ Uvnitř koule poloměru R a hustoty ϱ je kulová dutina poloměru $R/4$. Její střed je ve vzdálenosti $R/4$ od bodu S (středu velké koule) na spojnici PS, kde P je bod ve vzdálenosti x od povrchu velké koule (viz obrázek). Najděte zrychlení volného pádu $\boldsymbol{a}$ v bodě P.



Príklad 2

PROBLEM: An infinite 1D diatomic chain consists of masses m_1, m_2 connected by springs of constant k. The masses m_1, m_2 alternate positions.

(a) What are the frequencies of waves which propagate on the spring?

(b) What is the physics of the low frequency, long wavelength wave? Describe it in terms of how the neighboring masses move.

(c) What is the physics of the high frequency wave? Describe it in terms of how the neighboring masses move.

(d) At what frequencies would you *not* expect to observe a sustained oscillation?

Príklad 3

Problem. Assume that the water exerts drag force F on the boat, directly proportional to the boat's speed: $F = kv$, where k is a (nonzero) constant. How far from its initial position will the boat end up after the man walks from one end of the boat to the other? Everything starts at rest. The two masses and the length of the boat are given (m, M, L).