

METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH 1 leto25 – Príklady 3

Cvičenie 20. 3. 2025

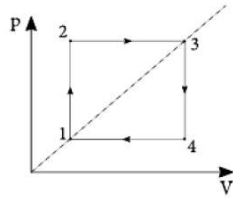
Príklad 1

Štyri rovnaké planéty s hmotnosťou m rozmiestnené do štvorca obiehajú okolo spoločného ťažiska po kružnici s polomerom R . Aká je perióda ich obehu?

Príklad 2

V nasledujúcom je vždy práve jedno riešenie úlohy správne. Nájdite ktoré to je bez toho, aby ste úlohu počítali.

Akú prácu vykoná n molov plynu pri nasledujúcom deji? Teploty v ľavom dolnom a prvom hornom rohu štvorca sú T_1 a T_3 .



❶ $W = nR \frac{T_3^2 T_1}{(T_3 - T_1)^2}$

❷ $W = nR (\sqrt{T_3} - \sqrt{T_1})^2$

❸ $W = nR (\sqrt{T_3} + \sqrt{T_1})^2$

❹ $W = nR (\sqrt{T_3} - \sqrt{T_1})^2$

❺ $W = nR \left(\frac{T_3 - T_1}{\sqrt{T_1}} \right)^2$

❻ $W = nR \sqrt{T_3 T_1}$

Ponorka používa na meranie hĺbky vodorovného dna ultrazvuk, čiže vysiela signál všetkými smermi. Následne zaznamenáva, kedy sa jej vráti signál odrazený od dna. Uvažujte ponorku pohybujúcu sa vodorovne rýchlosťou v . Ako vysoko je ponorka od dna, ak sa signál vrátil po čase T ? Rýchlosť zvuku vo vode je c .

❶ $h = \frac{vT}{2} \sqrt{1 - \frac{v^2}{c^2}}$

❷ $h = \frac{cT}{2} \sqrt{1 - \frac{v^2}{c^2}}$

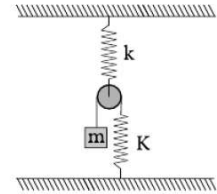
❸ $h = \frac{cT}{2} \frac{1}{1 + \frac{v^2}{c^2}}$

❹ $h = \frac{cT}{2} \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$

❺ $h = \frac{vT}{2} \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$

❻ $h = \frac{vT}{2}$

Aká je perióda kmitov tejto hračky?



❶ $T = 2\pi \sqrt{m \frac{4K+k}{kK}}$

❷ $T = 2\pi \sqrt{m \frac{K+4k}{kK}}$

❸ $T = 2\pi \sqrt{m \frac{K-k}{kK}}$

❹ $T = 2\pi \sqrt{m \frac{4K+k}{k^2}}$

❺ $T = 2\pi \sqrt{m \frac{4K+k}{K^2}}$

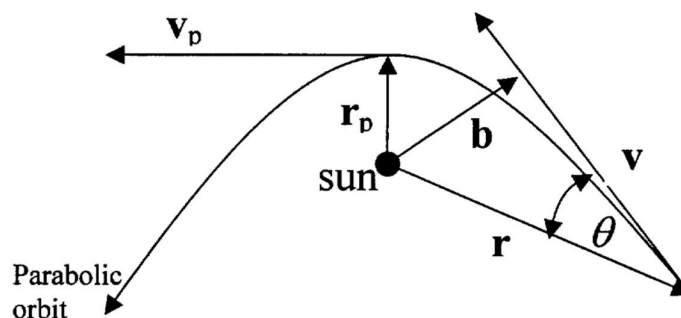
❻ $T = 2\pi \sqrt{m \frac{1}{k+K}}$

Príklad 3

Two parallel plates are maintained at temperatures T_L and T_R respectively and have emissivities ϵ_L and ϵ_R respectively. Given the Stephan-Boltzmann constant σ , express the net energy transfer rate per area from the left plate (L) to the right plate (R). *Hint: this problem can be solved by using an infinite series, or by finding the energy transfer rate per area to the right and left, I_R and I_L , respectively.*

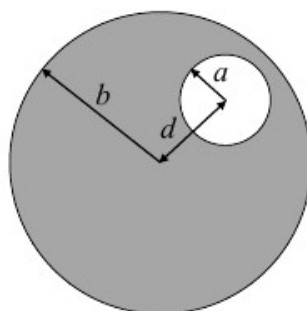
Príklad 4

[Classical Mechanics] A comet, barely unbound by the sun (its total energy vanishes), executes a parabolic orbit about it. At a certain time the comet is known to have a speed v and impact parameter b with respect to the sun. You may neglect the comet's mass m with respect to the sun's mass M . Find the perigee (distance of closest approach to the sun) of the comet.



Príklad 5

PROBLEM: A cylindrical hole of radius a is drilled in a solid cylinder of radius b . The two cylinder axes are parallel and are at a distance d apart. A constant current I flows in this structure, with uniform current density. Find the magnetic field at the center of the hole.



Príklad 6

A stick of length L is placed vertically by the wall. At its lower end sits a bug. The end B of the stick starts moving to the right with speed v , and at the same moment the bug starts crawling along the stick with speed u relative to the stick. What is the maximal height above the floor that the bug reaches while it crawls along the stick? End A of the stick does not lose contact with the wall.

