

METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH 1 leto22 – Príklady 3

Cvičenie 24.3.2022

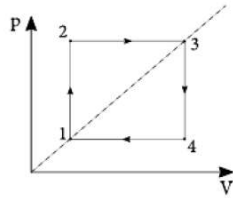
Príklad 1

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 .



1 $W = nR \frac{T_3^2 T_1}{(T_3 - T_1)^2}$

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

3 $W = nR (\sqrt{T_3} + \sqrt{T_1})^2$

4 $W = nR (\sqrt{T_3} - \sqrt{T_1})^2$

5 $W = nR \left(\frac{T_3 - T_1}{\sqrt{T_1}} \right)^2$

6 $W = nR \sqrt{T_3 T_1}$

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

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

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

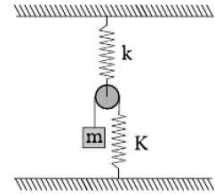
3 $h = \frac{cT}{2} \frac{1}{1 + \frac{v^2}{c^2}}$

4 $h = \frac{cT}{2} \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$

5 $h = \frac{vT}{2} \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$

6 $h = \frac{vT}{2}$

Aká je perióda kmitov tejto hračky?



1 $T = 2\pi \sqrt{m \frac{4K+k}{kK}}$

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

3 $T = 2\pi \sqrt{m \frac{K-k}{kK}}$

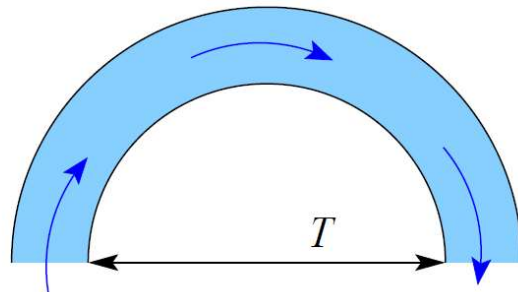
4 $T = 2\pi \sqrt{m \frac{4K+k}{k^2}}$

5 $T = 2\pi \sqrt{m \frac{4K+k}{K^2}}$

6 $T = 2\pi \sqrt{m \frac{1}{k+K}}$

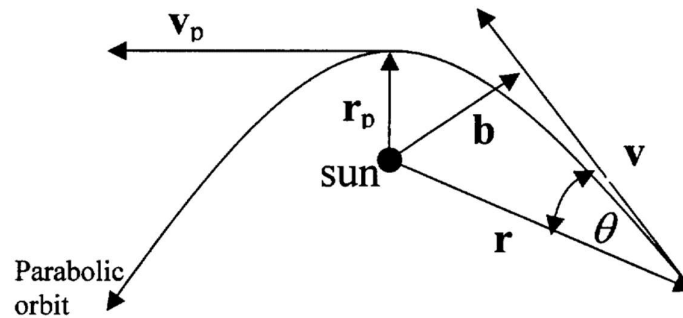
Príklad 3

Liquid of density ρ flows with speed v along a flexible pipe of cross-section S . What is the tension in the rope holding the end points of the pipe, if the pipe forms a semi-circle and the points are diametrically opposite to each other.



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

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 6

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.

