METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH zima20 – Príklady 5

Cvičenie 26.11.2020

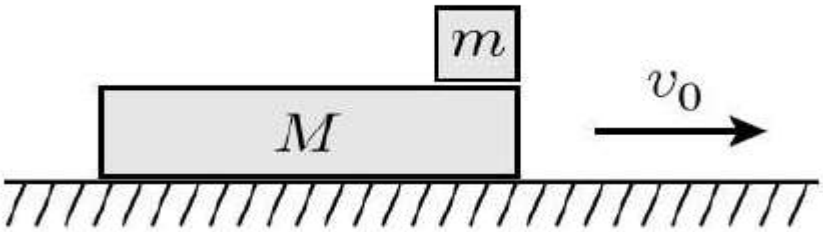
Príklad 1

An automobile drag racer drives a car with acceleration a and instantaneous velocity v. The tires (of radius r_0) are not slipping.

(a) Derive an equation for the position of a point on the bearing surface of the tire as a function of time.

(b) Find which point on the tire has the greatest acceleration relative to the ground. What is this acceleration?

Príklad 2

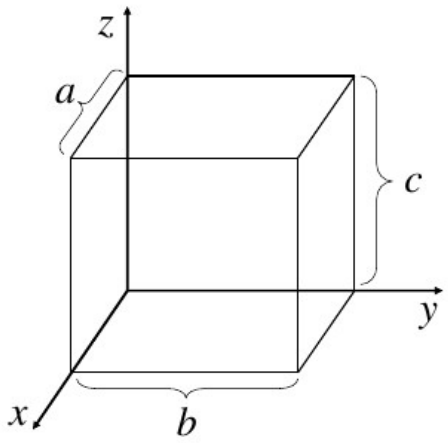


#1 : UNDERGRADUATE MECHANICS

PROBLEM: A board of length L and mass M can slide frictionlessly along a horizontal surface. A small block of mass m initially rests on the board at its right end, as shown in the figure. The coefficient of friction between the block and the board is μ. Starting from rest, the board is set in motion to the right with initial speed v_0. What is the smallest value of v_0 such that the block ends up sliding off the left end of the board? Assume the small block is sufficiently narrow relative to L that its width can be neglected.

Príklad 3

4. Consider a box with side lengths a, b, and c along the x, y, and z axes. Suppose there is no electric charge inside the box and that $\phi = 0$ on the surface of the box except at $z = 0$ where $\phi = V_1 \sin\left(\frac{\pi x}{a}\right) \sin\left(\frac{\pi y}{b}\right)$, and at $z = c$ where $\phi = V_2 \sin\left(\frac{2\pi x}{a}\right) \sin\left(\frac{2\pi y}{b}\right)$. Find ϕ everywhere inside the box.



Príklad 4

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.