Zadanie 1. (a)

$$\mathcal{E} = \frac{d\Phi}{dt} \qquad (-),\ (+) \quad \text{pominięte}$$

$$\Phi_{max} = B_0 A_0 N$$

$$I = \frac{dQ}{dt} \qquad I = \frac{\mathcal{E}}{NR}$$

$$dQ = I\,dt = \frac{\mathcal{E}}{NR}\,dt = \frac{d\Phi}{NR}$$

$$\int_0^{\tau} dQ = \frac{1}{NR} \int_0^{\tau} d\Phi$$

$$Q(\tau) - Q(0) = \frac{1}{NR}\left[\Phi(\tau) - \Phi(0)\right]$$

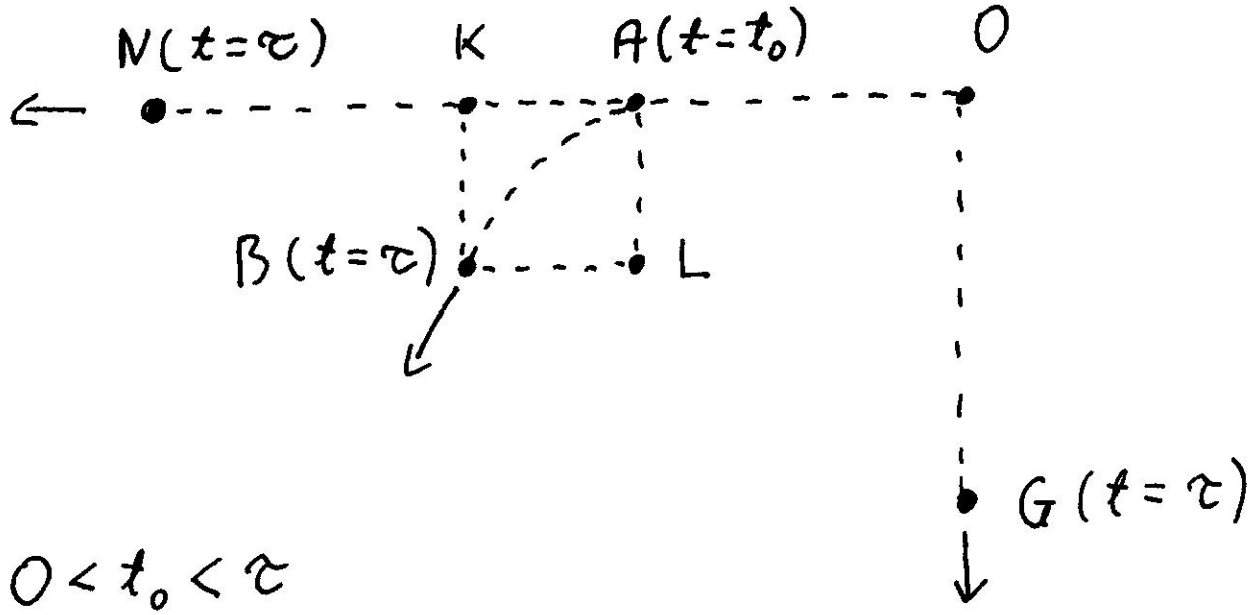
$$Q = \frac{\Phi_{max}}{NR} = \frac{B_0 A_0}{R} \qquad \square$$

Zadanie 1. (b)

$$Q = \frac{B_0 A_0}{R}$$

$\square$

Zadanie 2.



$0 < t_0 < \tau$

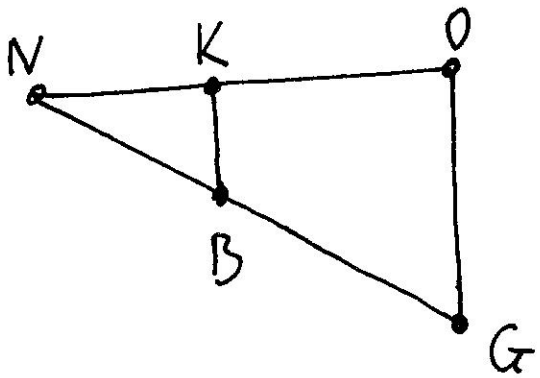
$ON = \frac{1}{2} a \tau^2 \qquad OG = \frac{1}{2} g \tau^2 \qquad \frac{OG}{ON} = \frac{g}{a}$

$OA = \frac{1}{2} a t_0^2 \qquad AL = \frac{1}{2} g (\tau - t_0)^2$

$AK = a t_0 (\tau - t_0)$

$$\frac{KB}{KN} = \frac{AL}{ON - (OA + AK)} = \frac{g}{a}$$

$$\frac{KB}{KN} = \frac{OG}{ON}$$

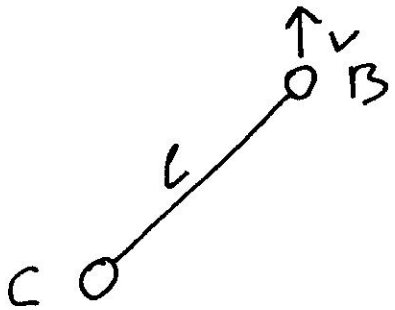


https://www.caltech.edu/about/news/leonardo-da-vincis-forgotten-experiments-explored-gravity-as-a-form-of-acceleration

□

Zadanie 3.

po zderzeniu a przed szarpnięciem



po szarpnięciu $\vec{b}$ - prędkość B

$\vec{c}$ - prędkość C

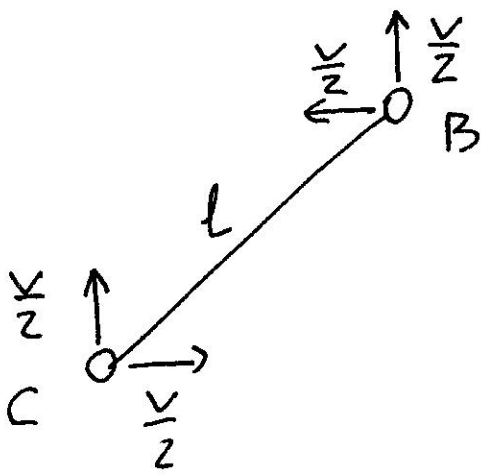
$$\begin{cases} c_x = c_y \\ 0 = m b_x + m c_x \rightarrow c_x = -b_x \\ mv = m b_y + m c_y \rightarrow v = b_y - b_x \end{cases}$$

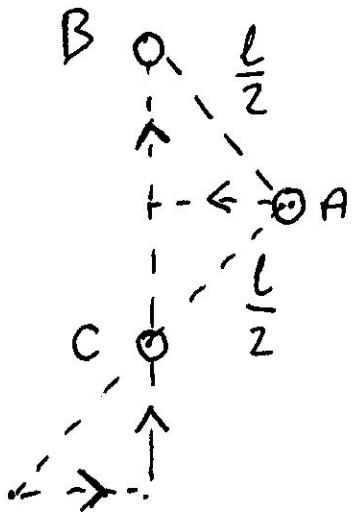
$$\frac{1}{2} m v^2 = \frac{1}{2} m (b_x^2 + b_y^2) + \frac{1}{2} m (c_x^2 + c_y^2)$$

$$v^2 = b_x^2 + (v + b_x)^2 + (-b_x)^2 + (-b_x)^2$$

$$b_x = -\frac{v}{2} \quad b_y = \frac{v}{2} \quad c_x = \frac{v}{2} \quad c_y = \frac{v}{2}$$

Zadanie 3. cd





$$t = \frac{\frac{l}{2}\,\frac{\sqrt{2}}{2}}{\frac{v}{2}} = \frac{\sqrt{2}}{2}\,\frac{l}{v}$$

□

Zadanie 4

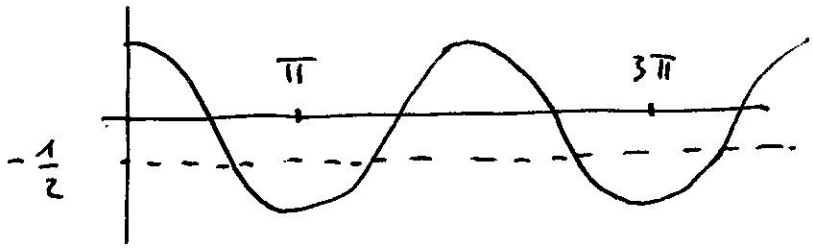
$$\cos(x+y) = \cos x \cos y - \sin x \sin y$$
$$\cos(x-y) = \cos x \cos y + \sin x \sin y$$

$$\cos(x+y) + \cos(x-y) = 2\cos x \cos y$$

$$A\cos\omega t + A\cos\omega(t-\tau) + A\cos\omega(t+\tau)$$

$$= A\cos\omega t\,(1 + 2\cos\omega\tau) = 0$$

$$\cos\omega\tau = -\frac{1}{2}$$



$$\omega\tau = n\pi \pm \frac{\pi}{3}$$

$$2\pi f \frac{L\sin\alpha}{V} = n\pi \pm \frac{\pi}{3}$$

$$f = \frac{V}{2L\sin\alpha}\left(n \pm \frac{1}{3}\right) \qquad n = 1, 3, 5 \ldots$$

□