N85

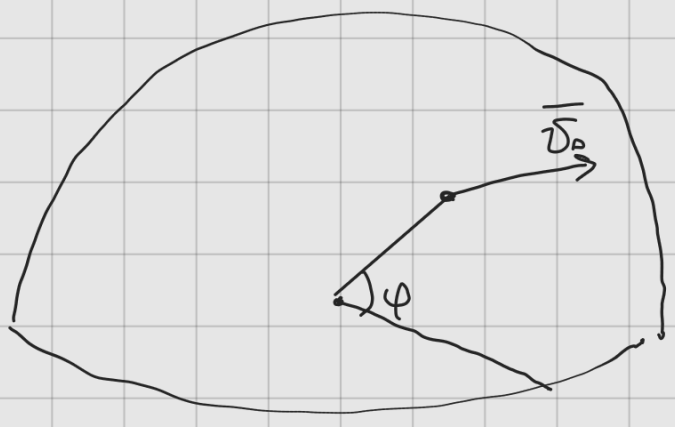
Дано:

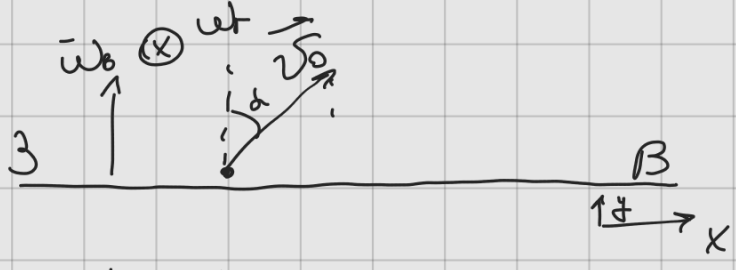
$v_0 = 100$ м/с

$\varphi = 60°$

Найти: α

Решение:





1) $\omega_r = \omega \cos\varphi$; $v_y = v_0 \cos\alpha - gt$

$v_x = v_0 \sin\alpha$

$a_x = -2\omega \cos\varphi (v_0 \cos\alpha - gt)$

$dv_x = -2\omega \cos\varphi (v_0 \cos\alpha - gt)\, dt$

с+ $v_x = -2\omega \cos\varphi \left(v_0 \cos\alpha\, t - \frac{gt^2}{2}\right)$, $C = -v_0 \sin\alpha$

$$\int_0^0 dv_x = \int_0^{\frac{2v_0\cos\alpha}{g}} \left(v_0 \sin\alpha - 2\omega \cos\varphi \left(v_0 \cos\alpha\, t - \frac{gt^2}{2}\right)\right) dt$$

$$0 = v_0 \sin\alpha\, t - 2\omega \cos\varphi \left(v_0 \cos\alpha \frac{t^2}{2} - \frac{gt^3}{6}\right) \Big|_0^{\frac{2v_0\cos\alpha}{g}}$$

$$v_0 \sin\alpha = \omega \cos\varphi\, v_0 \cos\alpha\, t - \frac{\omega \cos\varphi\, gt^2}{3}$$

$$v_0 \sin\alpha = \omega \cos\varphi \cdot v_0 \cdot \frac{\cos\alpha \cdot 2v_0 \cos\alpha}{g} - \frac{\omega \cos\varphi}{3} \cdot \frac{4v_0^2 \cos^2\alpha}{g}$$

$$\sin\alpha = \frac{2}{3g}\omega\cos\varphi\, v_0\cos^2\alpha \approx 1$$

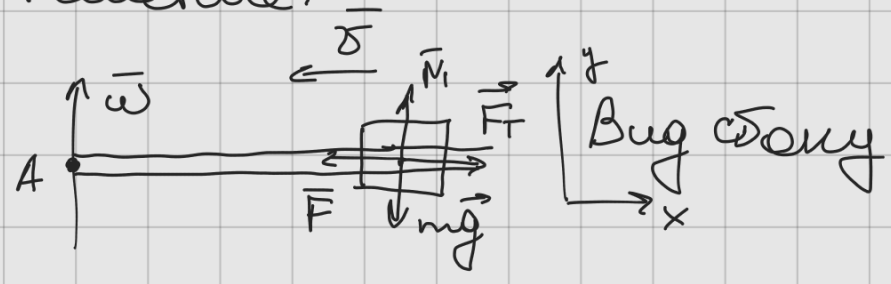
$\alpha \approx 2{,}47\cdot10^{-4}$ рад

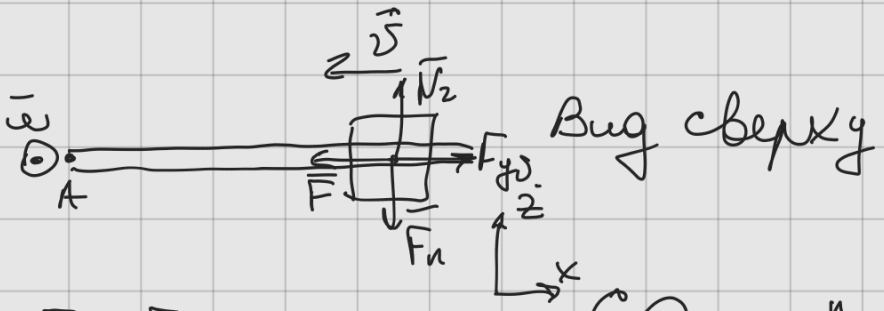
N86

Дано: m, ω, v, μ

Найти: A

Решение:





СО → Т. А

1) $\bar{F}_u = -m\bar{A}_{n.c.o} + \bar{F}_K + \bar{F}_{y.v}$

$\bar{A}_{n.c.o} = 0$, $\bar{F}_K = 2m[\bar{v}\times\bar{\omega}]$, $F_{y.v} = m\omega^2 R$

2) $Oy: N_1 = mg$ $\quad O z: N_2 = F_K = 2m\omega v$

$Ox: F_T + F_{yv} = F$

$$F_T = \mu N = \mu\sqrt{N_1^2 + N_2^2} = \mu m\sqrt{4\omega^2 v^2 + g^2}$$

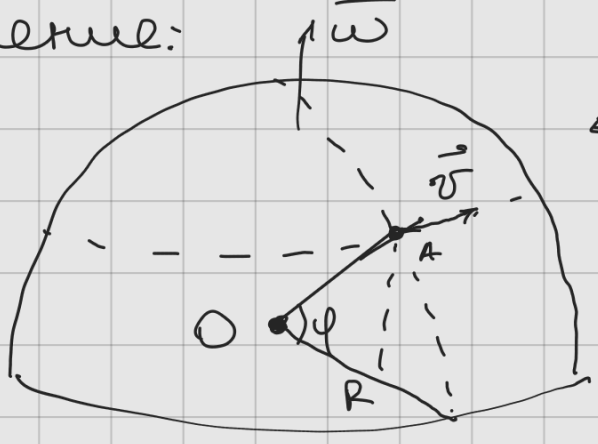
$$A = \int F\,dx = \int_0^L \left(\mu m\sqrt{4\omega^2 v^2 + g^2} + m\omega^2 x\right)dx$$

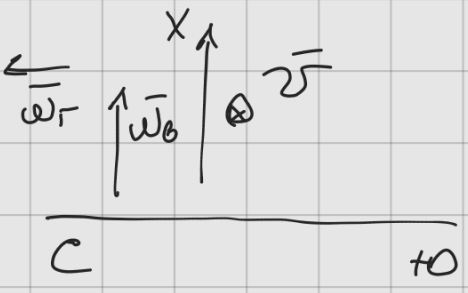
$$A = \mu m L\sqrt{4\omega^2 v^2 + g^2} + \frac{m\omega^2 L^2}{2}$$

N87

Дано:
$\varphi = 60°$
$v = 10$ м/с
P_0
Найти: P

Решение:





1) Покоящееся тело: $P_0 = mg - m\omega^2 R\cos\varphi$

2) $F_u = -m a_{отн} + F_к + F_{у.в}$ (СО → т. А.)

$a_{отн} = -\omega^2 R\cos\varphi - \frac{v^2}{R}$

$F_к = 2m v\omega\cos\varphi$

$F_{у.в} = 0$

$\omega^2 R\cos\varphi \ll g$

$P = mg - m\omega^2 R\cos\varphi - \frac{mv^2}{R} - 2mv\omega\cos\varphi \approx$

$\approx mg - \frac{mv^2}{R} - 2mv\omega\cos\varphi = P_0\left(1 - \frac{v^2}{gR} - 2v\omega\cos\varphi\right)$

№88

Дано:
$v_0 = 900$ м/с
$L = 18$ км
$\varphi = 60°$
Найти: Δl

Решение:

1) $t = \frac{L}{v_0}$;

$F_к = 2mv\omega\sin\varphi$

$a_x = 2v\omega\sin\varphi$

$S_x = v\omega\sin\varphi t^2 = \frac{v\omega\sin\varphi L^2}{v_0^2} = \frac{\omega\sin\varphi L^2}{v_0} =$

$= 22{,}6$ (м)