1.) a) $a = \frac{\Delta V}{\Delta t} = \frac{-6 \frac{m}{s}}{3 \ s} = -2 \ \frac{m}{s^2}$ (5)

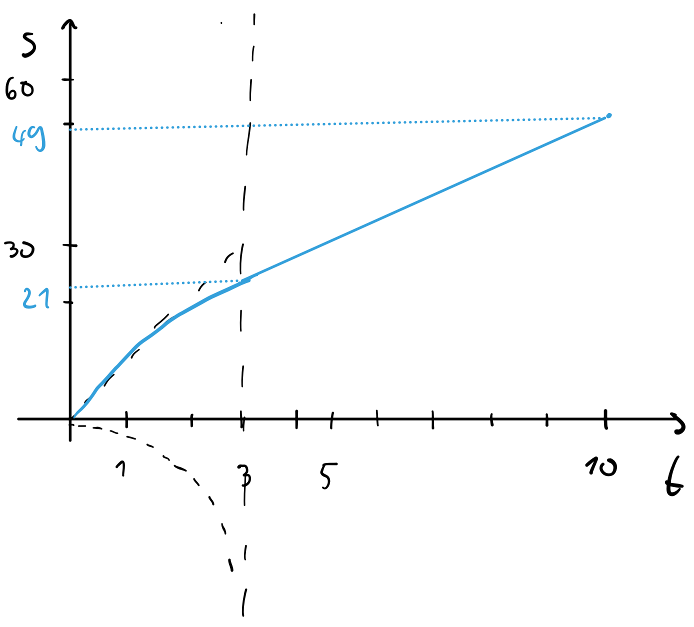
b) $s = s_1 + s_2 =$

$= v_1 t_1 + \frac{a_1 t_1^2}{2} + v_2 t_2 =$

$= 10 \cdot 3 + \frac{(-2) \cdot 3^2}{2} + 4 \cdot 7 =$

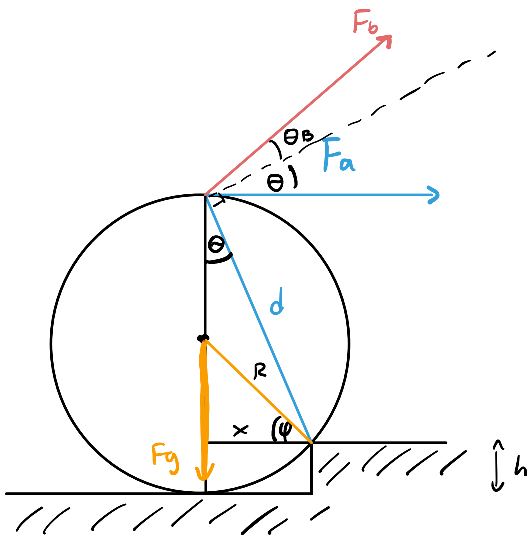
$= 30 - 9 + 28 = 49 \ m$ (10)

c) $s(t)$



(10)

2.)



Pogoj:

$M_{F_a} > M_{F_g}$

$r = 30\,cm$

$h = 10\,cm$

$m = 2\,kg$

$d^2 = x^2 + (2R-h)^2$

$x^2 + (R-h)^2 = R^2$ (5)

$\Rightarrow x = \sqrt{2Rh - h^2}$

$d = \sqrt{4R^2 - 2Rh}$

$M_{F_a} = F_a \cdot d \cdot \cos\theta$

$M_g = F_g\, R \cdot \cos\varphi$

$\cos\theta = \frac{2R-h}{d}$; $\cos\varphi = \frac{x}{R}$ (3)

$\hookrightarrow M_{F_a} = F_a \cdot \cancel{d} \cdot \frac{2R-h}{\cancel{d}} = F_a \cdot (2R-h)$

(2)

$\hookrightarrow M_g = m g \cdot \cancel{R} \cdot \frac{\sqrt{2Rh-h^2}}{\cancel{R}} = mg\sqrt{2Rh-h^2}$ (5)

$F_a(2R-h) > mg\sqrt{2Rh-h^2} \Rightarrow F_a > mg\frac{\sqrt{2Rh-h^2}}{2R-h} = 8.77\ N$

(5)

$M_{F_b} = F_b \cdot d \cdot \cos\theta_B$ $\theta_B = \frac{\pi}{4} - \theta = \frac{\pi}{4} - \arccos\left(\frac{2R-h}{\sqrt{4R^2-2Rh}}\right)$

$$\Rightarrow F_b > mg\frac{\sqrt{2Rh-h^2}}{\sqrt{4R^2-2Rh}\cdot\cos\left(\frac{\pi}{4} - \arccos\left(\frac{2R-h}{\sqrt{4R^2-2Rh}}\right)\right)} = 8.57\ N$$

(5)

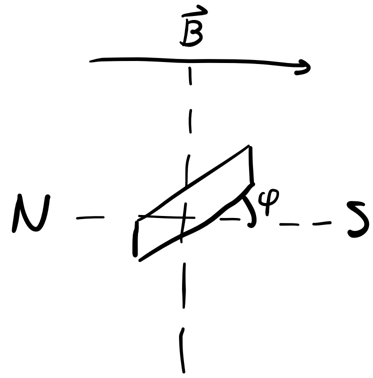
3.) $\nu = 50\ Hz$

$B = 0.1\ T$

$\varrho = 1.8 \cdot 10^{-2}\ \Omega \frac{mm^2}{m}$

$p = 0.9\ mm^2$

$a = 25 cm = 0.25 m$



$R = \varrho \frac{l}{p}$

$\phi_B = B \cdot A \cdot \sin\varphi$

$U_{i(t)} = \frac{d\phi_B}{dt}$ (2)

$= BA \cdot \cos\varphi \cdot \frac{d\varphi}{dt} =$ (3)

$= B \cdot a^2 \cdot \cos\varphi \cdot \omega = Ba^2 \cos\varphi_{(t)} \cdot 2\pi\nu = 2\pi B a^2 \nu \cos(2\pi\nu t)$ (5)

(5)

$U_{i\,MAX}$ pri $\varphi = 0 \Rightarrow U_i = 2\pi \cdot B a^2 \nu$

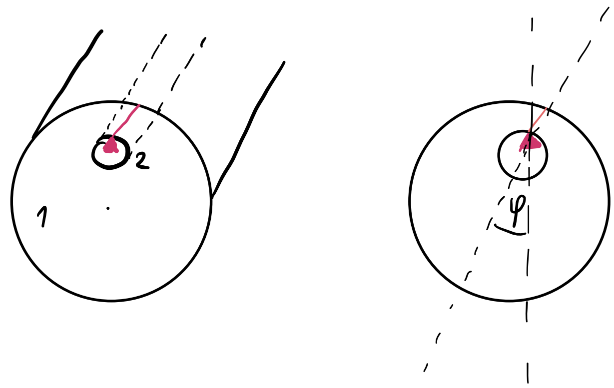
$I_{i\,(t)} = \frac{U_i}{R} = \frac{2\pi B a^2 \nu p}{\varrho l} \cdot \cos(2\pi\nu t)$ (5)

$I_{i\,MAX}$ pri $\varphi = 0 \Rightarrow I_i = \frac{2\pi B a^2 \nu p}{\varrho l} = 98A$ (5)

4.) $M = 5\,kg$

$R = 2m$

$d = \frac{R}{3}$



$S_2 = \pi \left(\frac{d}{2}\right)^2 = \frac{\pi R^2}{36}$

(2) Manjkajoča masa: $m_2 = \frac{S_2}{\pi R^2} M = \frac{M}{36}$

$J_1 = \frac{MR^2}{2} + M\left(\frac{2}{3}R\right)^2 = \frac{17}{18} M R^2$ (3)

$J_2 = \frac{(-m_2)\left(\frac{d}{2}\right)^2}{2} + (-m)\left(\frac{d}{2}\right)^2 = \frac{(-m_2)R^2}{24} = -\frac{MR^2}{36 \cdot 24}$ (5)

(3) $J = J_1 + J_2 = MR^2 \frac{816-1}{36 \cdot 24} = \frac{815}{864} MR^2$ (2)

$M = -Mg\frac{2R}{3} \cdot \sin\varphi - \left(-\frac{M}{36}\right)g\frac{R}{6}\sin\varphi =$

$= -MgR\left(\frac{2}{3} - \frac{1}{36 \cdot 6}\right)\sin\varphi \approx$ (3)

$\approx -MgR\frac{143}{216} \cdot \varphi$ (2)

$M = J\ddot{\varphi} \implies \ddot{\varphi} + \frac{MgR\,\frac{143}{216}}{MR^2\,\frac{815}{864}}\varphi = 0$

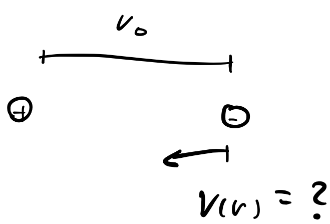
$\ddot{\varphi} + \underbrace{\frac{g}{R} \cdot \frac{572}{815}}_{\omega^2}\varphi = 0$ (3)

$\hookrightarrow t_0 = \frac{2\pi}{\omega} \approx 3.4\,s$ (2)

5.)

$e_1 = 4\,\mu As$

$e_2 = -3\,\mu As$



$$F_{(r)} = \frac{e_1 e_2}{4\pi\varepsilon_0 r} = \frac{-|e_1||e_2|}{4\pi\varepsilon_0 r^2}$$ (5)

LAHKO INTEGRIRAMO

$F = ma$ (5)

$$\frac{dv}{dt} = \frac{F_{(r)}}{m}$$

(5)

$$\frac{dv}{dr}\frac{dr}{dt} = \frac{F_{(r)}}{m} \Longrightarrow dv \cdot v = \frac{F_{(r)}}{m}\,dr \quad \Big/ \int$$

$$\frac{v^2}{2}\Bigg|_{v_0}^{v_1} = \frac{+|e_1||e_2|}{4\pi\varepsilon_0 m}\,\frac{1}{r}\Bigg|_{r_0}^{r}$$ (5)

$$\int \frac{1}{r^2}\,dr = -\frac{1}{r} + C$$

$$v_{(r)} = \pm\sqrt{\frac{|e_1||e_2|}{2\pi\varepsilon_0 m}\left(\frac{1}{r} - \frac{1}{r_0}\right)}$$ (5)

↑ (−) se približuje

ISTO DOBIMO IZ ENERGIJ ALI

$$W_{el\,pot\,0} + W_{k0} = W_{el\,pot\,1} + W_{k1}$$ (5)

$$\frac{e_1 e_2}{4\pi\varepsilon_0 r_0} + 0 = \frac{e_1 e_2}{4\pi\varepsilon_0 r} + \frac{mv^2}{2}$$ (10)

$$\frac{mv^2}{2} = \frac{e_1 e_2}{4\pi\varepsilon_0}\left(\frac{1}{r_0} - \frac{1}{r}\right) = \frac{-|e_1||e_2|}{4\pi\varepsilon_0}\left(\frac{1}{r_0} - \frac{1}{r}\right)$$ (5)

$$v = \pm\sqrt{\frac{|e_1||e_2|}{2\pi\varepsilon_0 m}\left(\frac{1}{r} - \frac{1}{r_0}\right)}$$ (5)