

① a) $v(t=7s) = ?$

b) ~~$a(t=7s) = ?$~~

$a(7s - 12s) = ?$

c) $x(t)$

$a(t)$

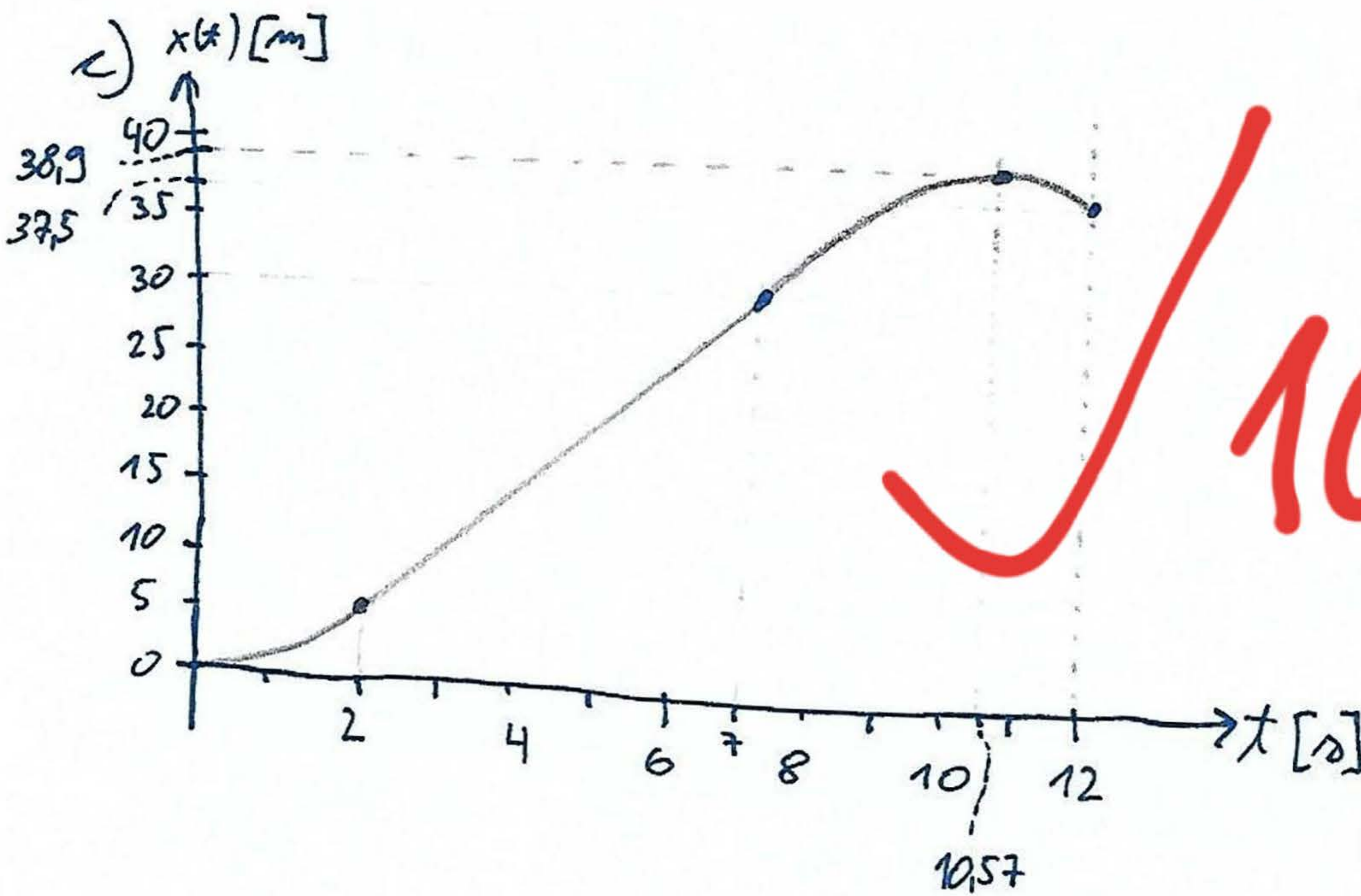
a) $a_1 = \frac{\Delta v}{\Delta t} = \frac{5 \frac{m}{s} - 0 \frac{m}{s}}{2s - 0s} = 2,5 \frac{m}{s^2}$

$v_2 = v \cdot t = 5 \frac{m}{s} \cdot 5s = 25 \frac{m}{s}$

$s_1 = \frac{a_1 t^2}{2} = 2,5 \frac{m}{s^2} \cdot \frac{(2s)^2}{2} = 5m$

$s_2 = s_1 + s_2 = 30m$

b) $a_2 = \frac{\Delta v}{\Delta t} = \frac{v(t=12s) - v(t=7s)}{12s - 7s} = \frac{-2 \frac{m}{s} - 5 \frac{m}{s}}{5s} = -1,4 \frac{m}{s^2}$



$v_{30} = v(t=7s) = 5m/s$

$v_3(t) = v_{30} + a_2 \cdot t$

$v_3(t=?) = 0$

$0 = v_{30} + a_2 \cdot \Delta t$

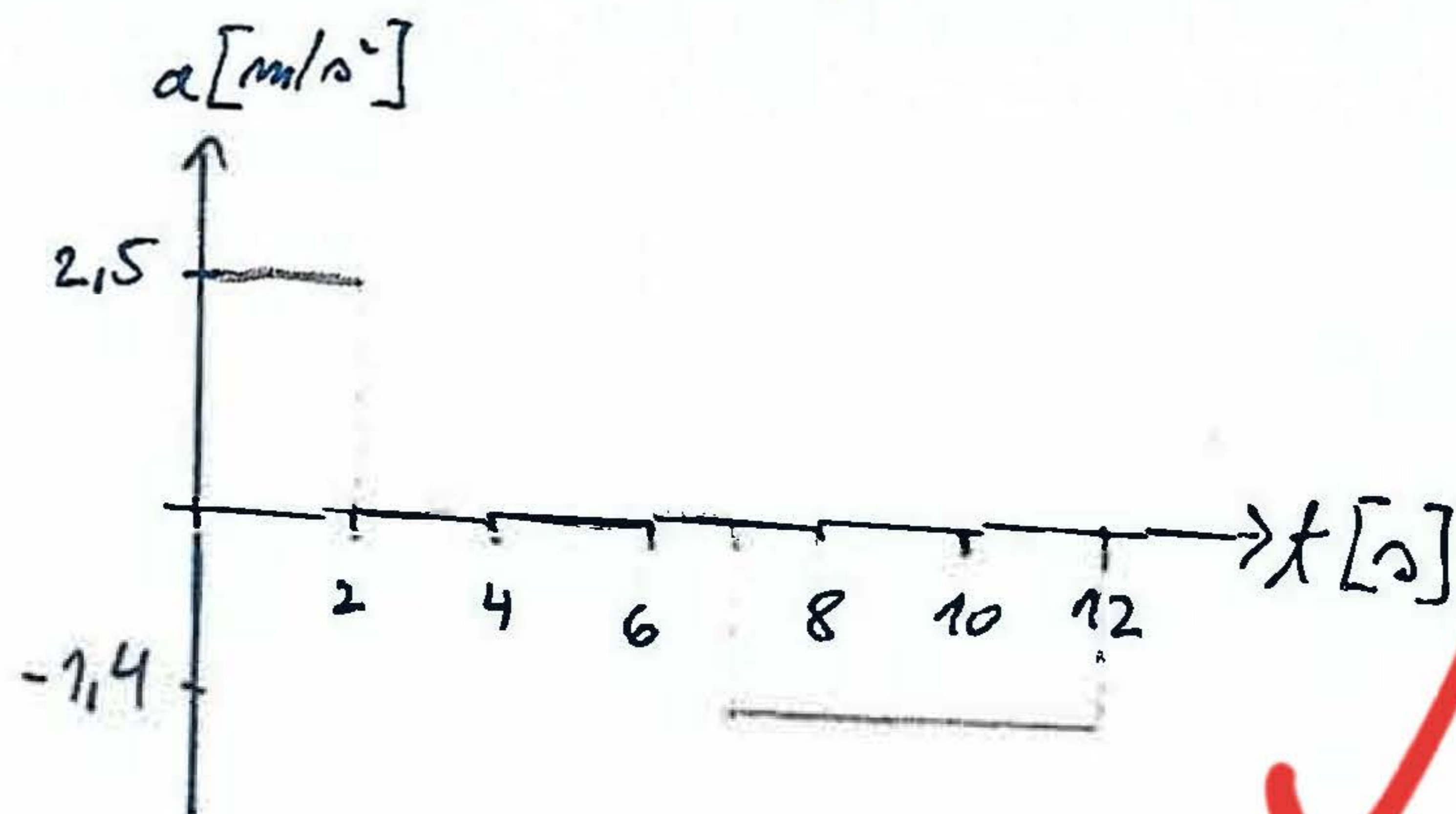
$\Delta t = -\frac{v_{30}}{a_2} = -\frac{5 \frac{m}{s}}{-1,4 \frac{m}{s^2}} = 3,57s$

$s(\Delta t = 3,57s) = s_0 + v_{30} \cdot \Delta t + \frac{a_2 (\Delta t)^2}{2}$

$s = 30m + 5 \frac{m}{s} \cdot 3,57s - \frac{1,4 \frac{m}{s^2} (3,57s)^2}{2}$

$s = 38,9m$

$s(\Delta t = 1,43s) = s_0 + \frac{a_2 (\Delta t)^2}{2} = 38,9m - \frac{1,4m (1,43s)^2}{2} = 37,47m$



2) $M = 30 \text{ t}$
 $v_M = 10 \text{ km/h} = v_v = 2,8 \frac{\text{m}}{\text{s}}$
 $m = 20 \text{ kg}$
 $v_m = 200 \text{ m/s} = v_k$
 $\alpha = 40^\circ$

a) $v_v' = ?$
 b) $F \Delta t = ?$

a) $\Delta \vec{G} = \vec{F} \cdot \Delta t$

$\hookrightarrow_x: \Delta G_x = 0$

$G_{kx} - G_{vz} = 0$

$M v_v' + m v_k \cdot \cos \alpha - M v_v = 0$

$v_v' = \frac{M v_v - m v_k \cos \alpha}{M} = \underline{\underline{2,698 \frac{\text{m}}{\text{s}}}}$

b) $y: \Delta G_y = F_y \cdot \Delta t = ? \quad (F_x = 0)$

$G_{kx} - G_{vz} = F_y \Delta t$

$m v_k \sin \alpha - 0 = F_y \Delta t$

$F_y \Delta t = \underline{\underline{257,71 \text{ Nm}}}$

3) $J_1 = 1,5 \text{ kg m}^2$
 $\omega_1 = 2,5 \text{ s}^{-1}$
 $J_2 = 1 \text{ kg m}^2$

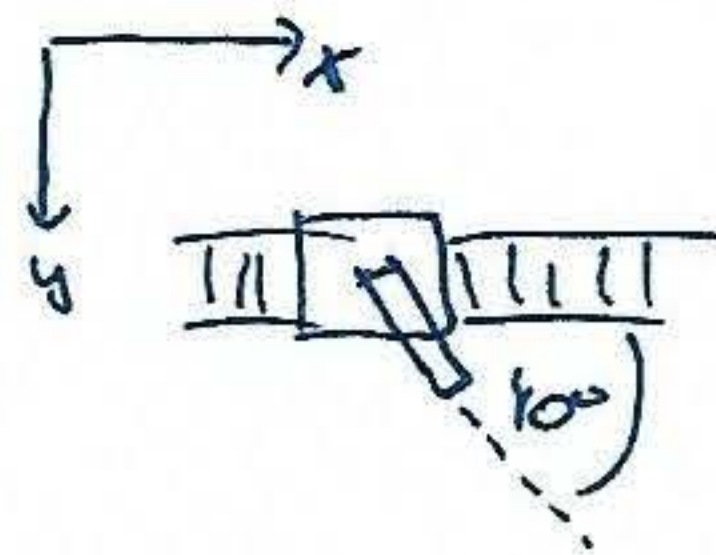
a) $\omega_2 = ?$
 b) $A = ?$

a) $\Delta \Gamma = 0$

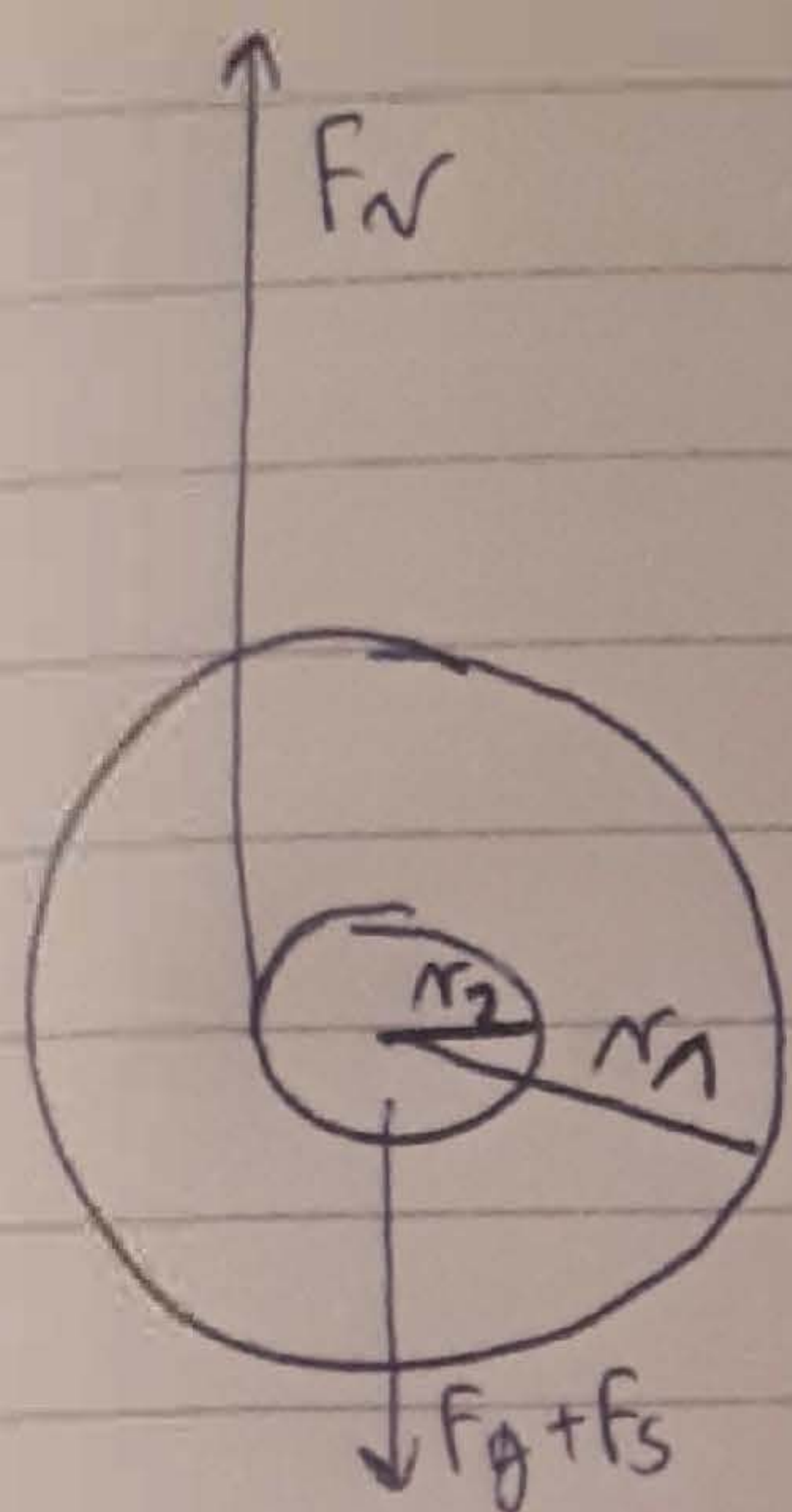
$0 = \Gamma_2 - \Gamma_1 = J_2 \omega_2 - J_1 \omega_1$

$\omega_2 = \frac{J_1}{J_2} \omega_1 = \underline{\underline{3,75 \text{ s}^{-1}}}$

b) $A = \Delta W^{\text{rot}} = W_2^{\text{rot}} - W_1^{\text{rot}} = J_2 \frac{\omega_2^2}{2} - J_1 \frac{\omega_1^2}{2} = \underline{\underline{2,34 \text{ J}}}$

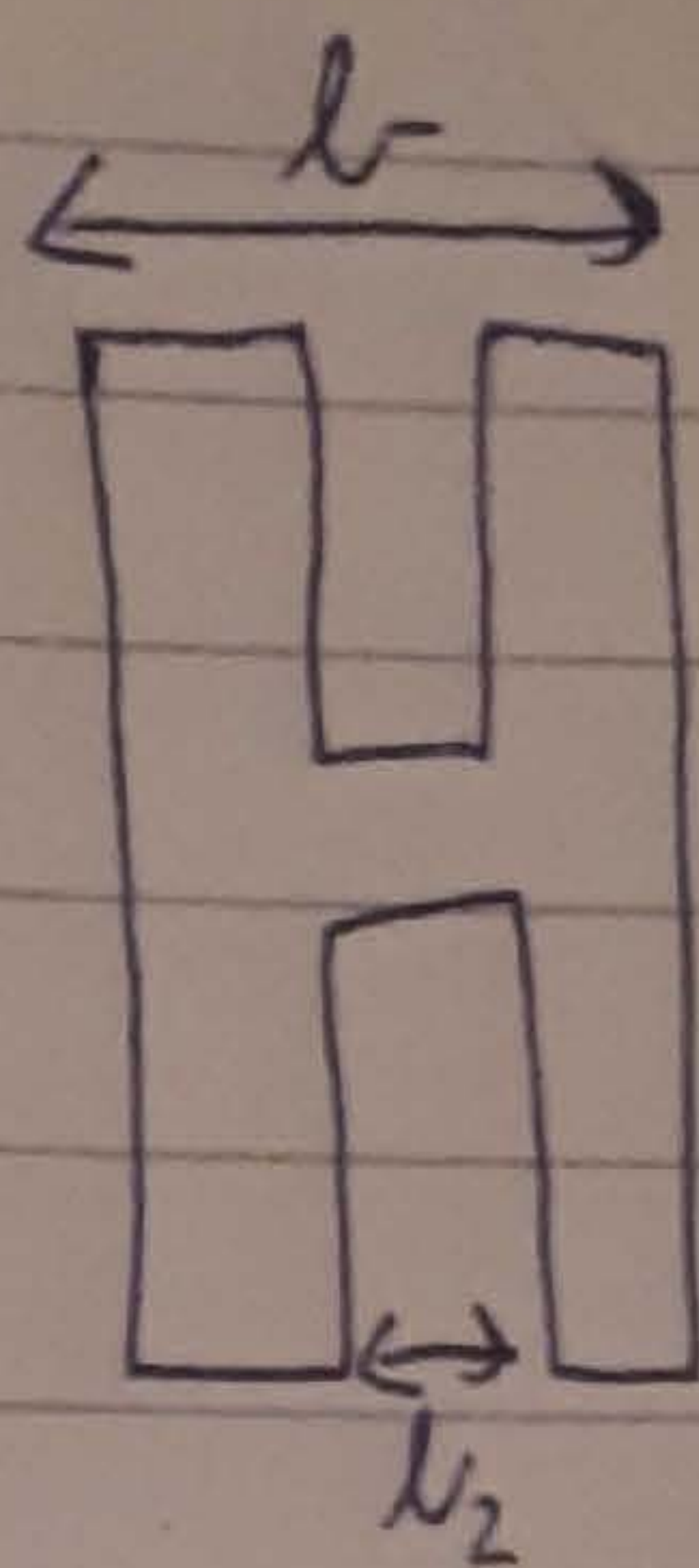


4)



$$r_1 = 3 \text{ cm} \quad b_1 = 2 \text{ cm}$$

$$r_2 = 1 \text{ cm} \quad b_2 = 1 \text{ cm}$$



$$b_1 = b - b_2$$

$$F = m \cdot a_{\text{jojo}} = F_g + F_s - F_v$$

$$F_g = mg$$

$$F_s = m a_s$$

$$M = F_v \cdot r_2 = J \cdot \alpha \quad \text{glek na središče jojota}$$

$$F_v = \frac{J a_{\text{jojo}}}{r_2} = \frac{J a_{\text{jojo}}}{r_2^2}$$

$$\alpha = \frac{a_{\text{jojo}}}{r_2}$$

$$m \cdot a_{\text{jojo}} = m(g + a_s) - a_{\text{jojo}} \frac{J}{r_2^2}$$

$$a_{\text{jojo}} \left(m + \frac{J}{r_2^2} \right) = m(g + a_s)$$

$$a_{\text{jojo}} = (g + a_s) \frac{m}{m + \frac{J}{r_2^2}}$$

$$m = \sum r_i^2 b_i \pi S = r_1^2 b_1 \pi S + r_2^2 b_2 \pi S$$

$$J = \sum_i \frac{m_i r_i^2}{2} =$$

$$= \frac{1}{2} r_1^4 b_1 \pi S + \frac{1}{2} r_2^4 b_2 \pi S$$

vstavimo, S se pokrajša
π se pokrajša

$$a_{\text{jojo}} = (g + a_s) \frac{r_1^2 b_1 + r_2^2 b_2}{r_1^2 b_1 + r_2^2 b_2 + \frac{1}{2} \frac{r_1^4}{r_2^2} b_1 + \frac{1}{2} r_2^2 b_2}$$

$$= \left(11 \frac{\text{m}}{\text{s}^2} \right) \frac{(3 \text{ cm})^2 2 \text{ cm} + (1 \text{ cm})^2 1 \text{ cm}}{(3 \text{ cm})^2 2 \text{ cm} + (1 \text{ cm})^2 1 \text{ cm} + \frac{1}{2} \frac{(3 \text{ cm})^4}{(1 \text{ cm})^2} 2 \text{ cm} + \frac{1}{2} (1 \text{ cm})^2 1 \text{ cm}}$$

$$= 11 \frac{\text{m}}{\text{s}^2} \cdot 0.189 = 2.08 \frac{\text{m}}{\text{s}^2}$$

$$t = \sqrt{\frac{2L}{a_{\text{jojo}}}} = \sqrt{\frac{2 \cdot 1 \text{ m}}{2.08 \text{ m/s}^2}} = 0.98 \text{ s}$$

$$g = G \frac{M}{R^2}$$

$$M = 6 \cdot 10^{24} \text{ kg}$$

$$R = 6,4 \cdot 10^6 \text{ m}$$

$$g = 9,81 \text{ m/s}^2$$

$$a) \quad g = G \frac{M}{R^2}$$

$$G = \frac{R^2 g}{M} = 2743 \frac{\text{m}^5}{\text{kg s}^2}$$

$$b) \quad \Delta W_k = \Delta W_p$$

$$b) \quad A_g = \int_R^\infty F_g \cdot dr = G m M \int_R^\infty \frac{1}{r^2} dr = G m M \frac{1}{3R^3}$$

$$\frac{m v^2}{2} = G m M \frac{1}{3R^3}$$

$$v = \sqrt{\frac{2GM}{3R^3}} = 4,14 \cdot 10^{10} \frac{\text{m}}{\text{s}}$$

(4)