

Вариант задания

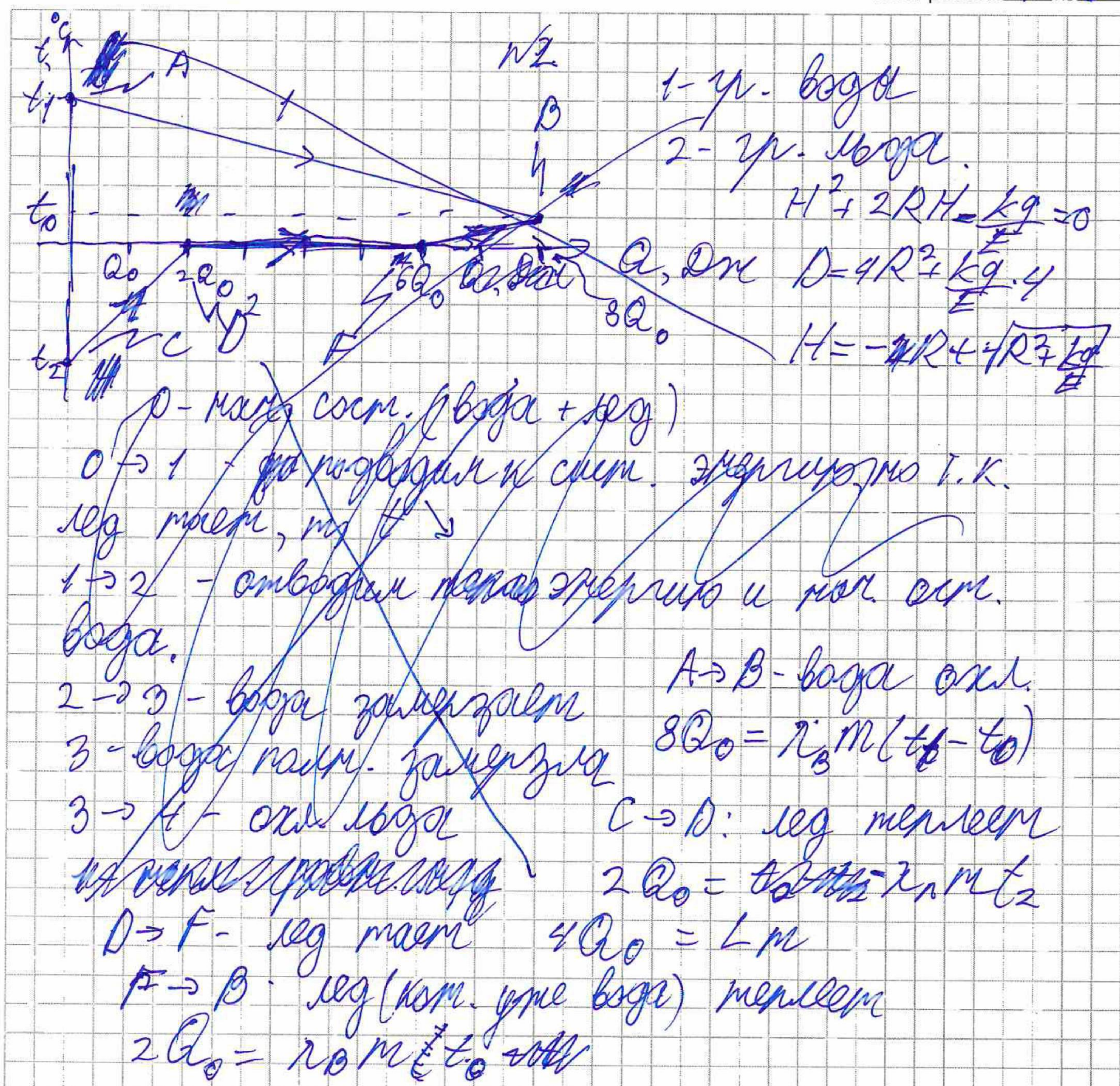
1

Лист работы

1

из

5





$$4 \lambda_B m t_0 = \lambda_B m (t_1 - t_0)$$

$$t_1 = 5 t_0$$

$$8 Q_0 = m \lambda_B (t_1 - t_0)$$

$$2 Q_0 = m \lambda_A (273 - t_2)$$

$$4 Q_0 = m L$$

$$2 Q_0 = m \lambda_B (t_0 - 270)$$

$$\frac{2 Q_0}{4 Q_0} = \frac{-\lambda_A m t_2}{L m}$$

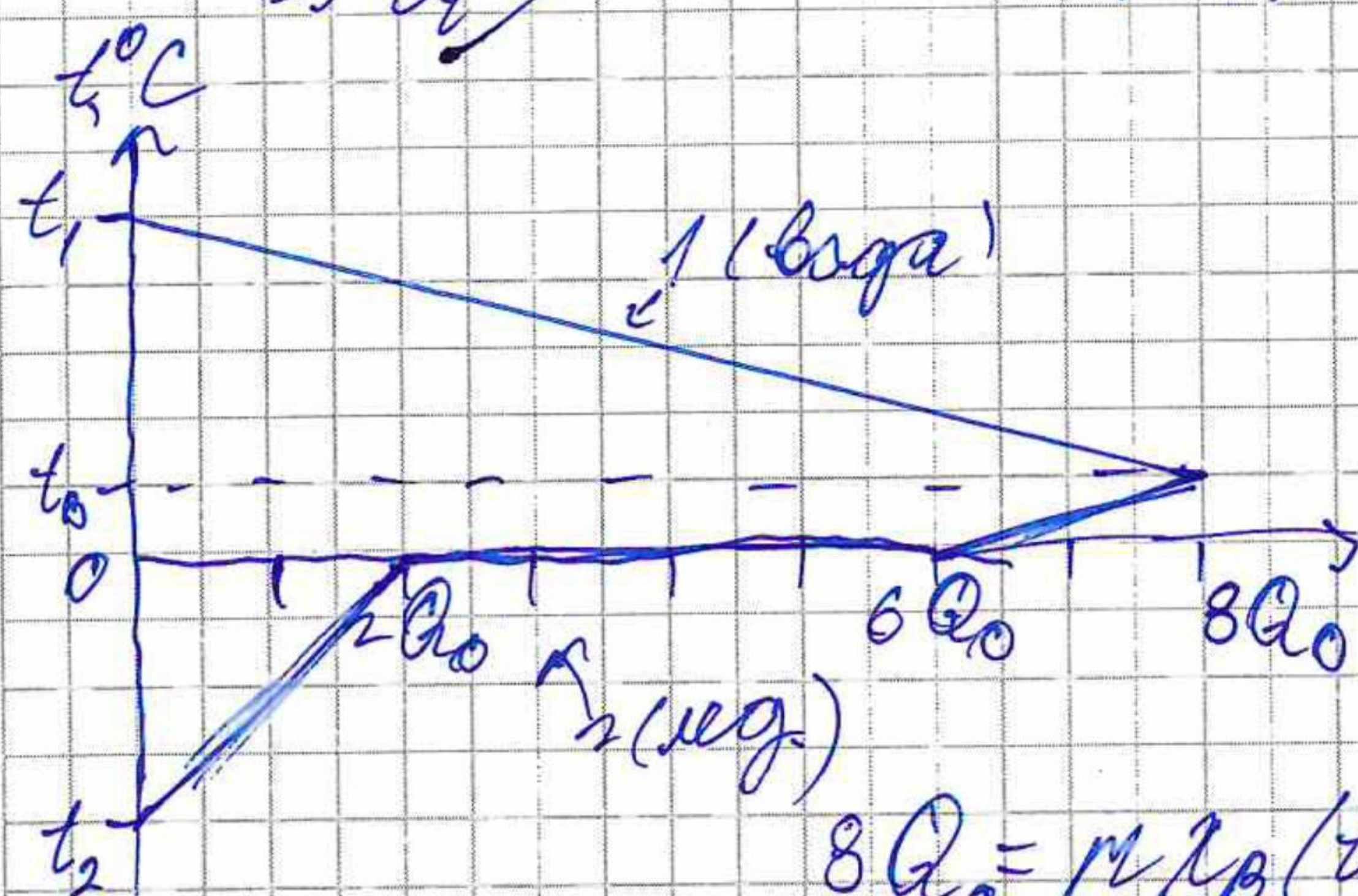
$$t_2 = \frac{L}{\lambda_A} \cdot \frac{1}{2} = -76,2^\circ \text{C}$$

$$\frac{2 Q_0}{4 Q_0} = \frac{\lambda_B m t_0}{L m}$$

$$t_0 = \frac{L}{\lambda_B} \cdot \frac{1}{2} = 38,1^\circ \text{C}$$

$$\Rightarrow t_1 =$$

$$m/2$$



$$8 Q_0 = m \lambda_B (t_1 - t_0)$$

$$2 Q_0 = m \lambda_A (0 - t_2)$$

$$4 Q_0 = m L$$

$$2 Q_0 = m \lambda_B (t_0 - 0)$$

$$8 Q_0 = m \lambda_B (t_1 - t_0) = 4 m \lambda_B t_0$$

$$5 t_0 = t_1$$

$$\frac{4 Q_0}{2 Q_0} = \frac{m L}{m \lambda_B t_0}$$

$$t_0 = \frac{L}{\lambda_B} \cdot \frac{1}{2} = 38,1^\circ \text{C}$$

$$t_2 = \frac{L}{\lambda_A} \cdot \frac{1}{2} = -76,2^\circ \text{C}$$

$$t_1 = 190,5^\circ \text{C}$$

$$\text{Omb: } t_2 = -76,2^\circ \text{C}; t_1 = 190,5^\circ \text{C}; t_0 = 38,1^\circ \text{C}$$



Вариант задания

1

Лист работы 2 из 5

№3.

Используя закон сохранения энергии на участке:

ИЗН:

ОХ: $mg \frac{x}{l} d\theta$

ОУ: $N_1 \cdot \mu - N + mg \frac{x}{l} \cdot \sin \alpha$

ОХ: $N_1 = mg \frac{x}{l} \cdot \cos \alpha$

$mg \frac{x}{l} \alpha = (\mu \cos \alpha + \sin \alpha) - N \cdot \frac{l}{x} \cdot \frac{1}{\mu}$

ОУ: $mg(1 - \frac{x}{l}) = N$

$\alpha = (\mu \cos \alpha + \sin \alpha) - \alpha \frac{l}{x} + \alpha$

$\alpha = \frac{x}{l} (\mu \cos \alpha + \sin \alpha) = \frac{x}{l} (\frac{4}{5})$

$\frac{dv}{dt}$

$$dA_{F_{\text{тр}}} = -F_{\text{тр}} d\pi = -\mu N_1 d\pi = -\mu mg \cdot \cos \alpha \cdot x d\pi$$

1) $l = 0,05$

$$\frac{mv_0^2}{2} = \frac{mv_1^2}{2} + mg S \sin \alpha - A_{F_{\text{тр}1}}$$

$$A_{F_{\text{тр}1}} = \frac{1}{2} S \cdot \mu mg \cdot \cos \alpha + \frac{S \mu}{2 \cdot 2} \cdot \mu mg \cos \alpha (-1) =$$
$$= -\frac{3}{4} S \mu mg \cos \alpha$$



$$N_1^2 = \left(\frac{3}{4} S \cdot \frac{1}{5} \cdot g \cdot 2 + g S \cdot \frac{3}{5} - v_0^2 \right) (-1) =$$

$$= -\frac{3}{2} S g + v_0^2$$

2) $L = 2S$:

$$\frac{m v_0^2}{2} = \frac{m v_2^2}{2} + m g S \sin \alpha + \mu m g \cos \alpha \cdot \frac{S^2}{2 \cdot 2S}$$

$$v_2^2 = \left(-v_0^2 + 2 g S \frac{3}{5} + S g \cdot \frac{1}{4} \cdot \frac{1}{5} \right) (-1) =$$

$$= \frac{5}{4} g S + v_0^2$$

$$v_2 - v_1 = \sqrt{v_0^2 + \frac{5}{4} g S} - \sqrt{v_0^2 - \frac{3}{2} S g} = \text{Omb.}$$

Omb: podgumens dygem na segizhke 2S.

N4



$$E = k \frac{q}{r^2}$$

$$r^2 = H^2 + D^2$$

$$\sqrt{\frac{k q^2}{E^2} - D^2} = H$$

$$E \cdot \sin \alpha = E \frac{H}{r} \approx k \frac{q^2}{H^2 + D^2} \cdot \frac{H}{\sqrt{H^2 + D^2}}$$

$$H = \sqrt{135 \cdot 10^6 - D^2}$$

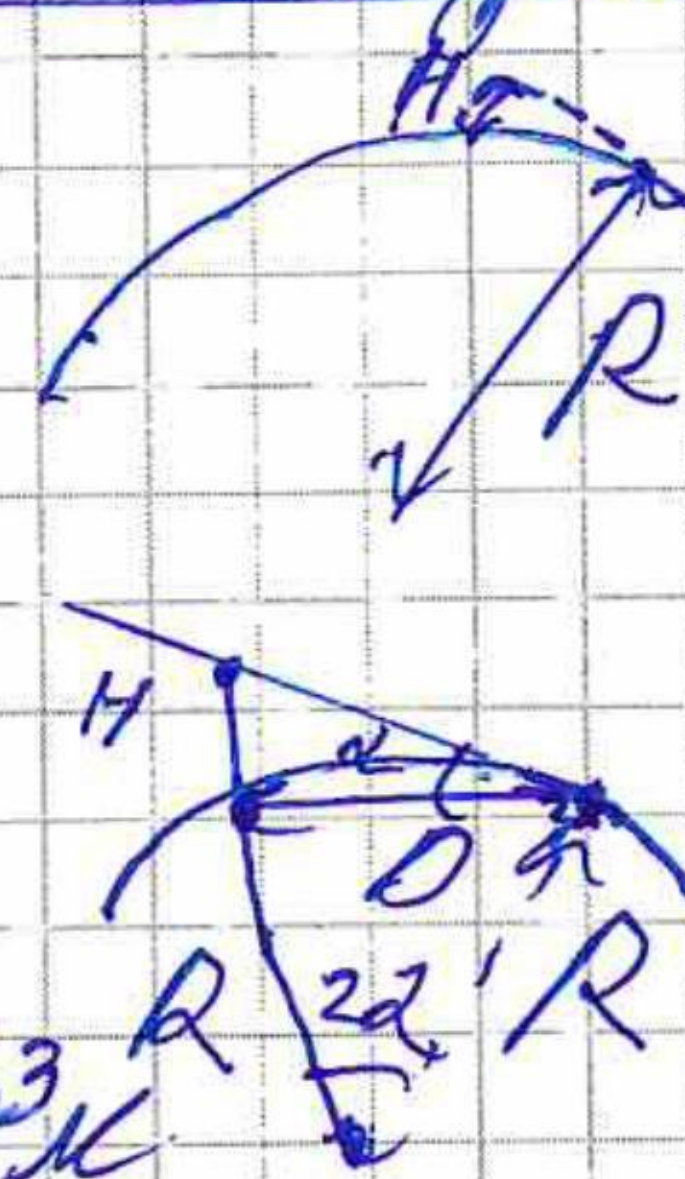
$$\sin \alpha \approx \frac{H}{R} \approx \frac{H}{D}$$

$$\sin \alpha = \frac{D}{2R} \approx \frac{H}{D}$$

$$D^2 = 2 R H$$

$$R = 6400 \cdot 10^3 \mu$$

Omb: $H = \sqrt{135 \cdot 10^6 - D^2} \mu$



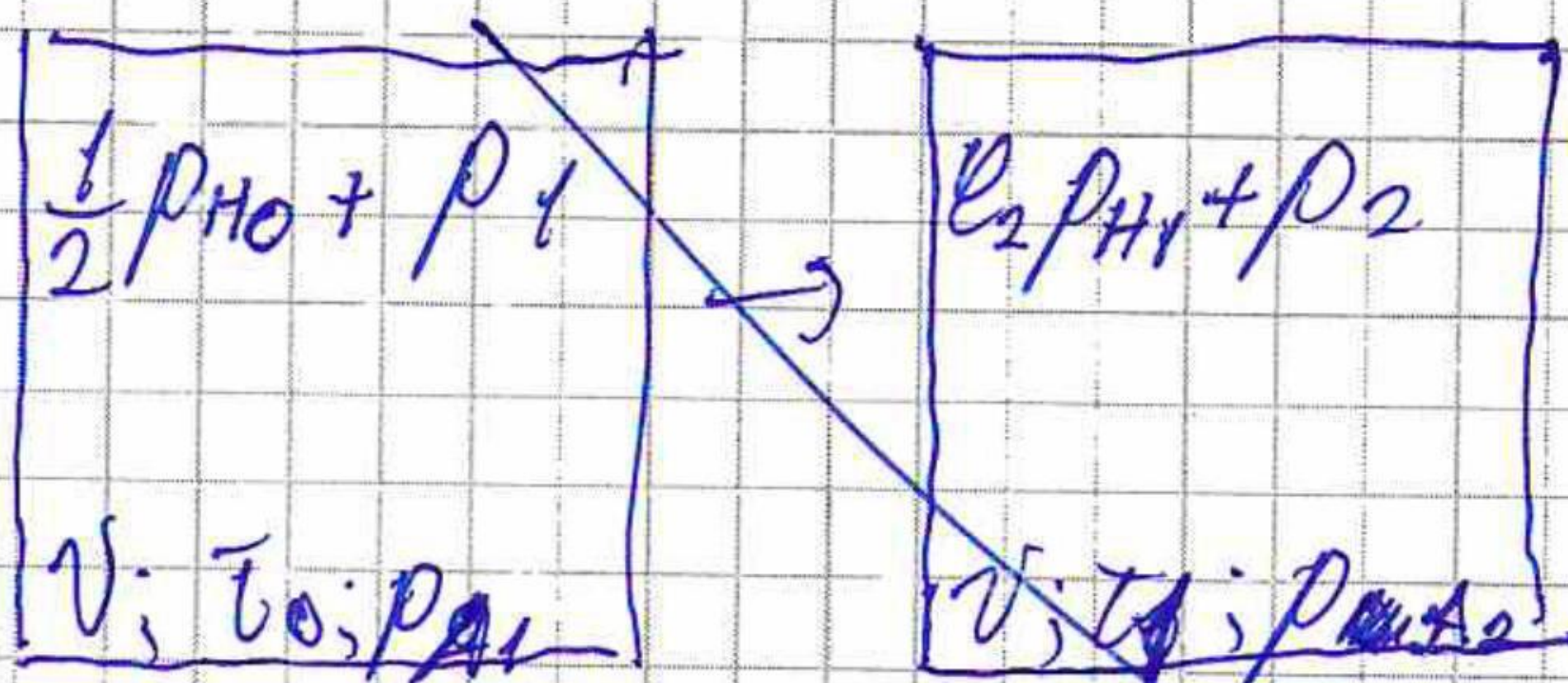


Вариант задания 1

Лист работы 1 из 2

№
 $Q = N \cdot t = 440 \text{ Дж} \cdot 612 \text{ КДж}$

$V = 60 \text{ м}^3$
 $T_0 = 293 \text{ К}$



$p_0 = p_1 + \frac{1}{2} p_{no}$

$p_{no} = 23388 \text{ Па}$

$p_1 = 98830,6 \text{ Па}$

$(p_1 - p_2)V = \gamma R(T_0 - T_1)$

$(p_{no} \frac{1}{2} - p_2 p_{n1})V = \gamma R(T_0 - T_1)$

~~Q12~~
~~Q12~~
~~Q12~~

$p_2 p_{n1} = p$

$p_1 V = \gamma R T_0$; $p_{no} V = \gamma_0 R T_0$

$p_2 V = \gamma R T_1$; $p V = \gamma_0 R T_1$

$p_0 = p_2 + p$

$p_2 = p_0 - p$

$\frac{p_0 - p}{p} = \frac{\gamma}{\gamma_0} = \frac{p_1 \cdot 2}{p_{no}}$

$p = \frac{p_0}{\left(\frac{2p_1}{p_{no}} + 1\right)} = 1169,4 \text{ Па}$

$$Q = N \cdot t = 612 \text{ kJ}$$

№5.

$$T_1 = 293 \text{ K}$$

$$P_{B1} = 1169,4 \text{ Pa}$$

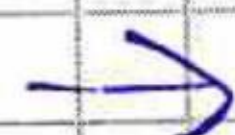
$$P_{K1} = 98830,6 \text{ Pa}$$

$$V = 60 \text{ m}^3$$

$$i_B = 7$$

$$i_K = 6$$

$$\begin{array}{c} P_{B1} + P_{K1} \\ V; T_1; P_{A1} \end{array}$$



$$\begin{array}{c} P_{B2} + P_{K2} \\ V; T_2; P_{A2} \end{array}$$

$$P_{B1} V = \gamma_B R T_1$$

$$P_{K1} V = \gamma_K R T_1$$

$$P_{B2} V = \gamma_B R T_2$$

$$P_{K2} V = \gamma_K R T_2$$

$$Q = \frac{i_B}{2} \gamma_B R (T_2 - T_1) + \frac{i_K}{2} \gamma_K R (T_2 - T_1) =$$

$$= \frac{i_B}{2} V (P_{B2} - P_{B1}) + \frac{i_K}{2} V (P_{K2} - P_{K1})$$

$$\frac{P_{B2}}{P_{K2}} = \frac{\gamma_B}{\gamma_K} = \frac{P_{B1}}{P_{K1}}$$

$$P_{K2} = P_{B2} \frac{P_{K1}}{P_{B1}}$$

$$\frac{2Q}{V} = \left(i_B + \frac{P_{K1}}{P_{B1}} i_K \right) P_{B2} - \frac{i_B}{P_{B1}} P_{B1} - i_K P_{K1}$$

$$P_{B2} = \frac{\frac{2Q}{V} + i_B P_{B1} + i_K P_{K1}}{i_B + i_K \frac{P_{K1}}{P_{B1}}} = 1209,1 \text{ Pa}$$

$$T_2 = T_1 \frac{P_{B2}}{P_{B1}} = 302,95 \text{ K} \quad t_2 = 29,8^\circ \text{C}$$

$$\Rightarrow \varphi_2 = \frac{P_{B2}}{P_{A2}} = 0,285$$

Отв: при 28,5%





Вариант задания

1

Лист работы 4 из 3

$$N = p \cdot S = p \pi r^2 \omega$$
$$V_1 = \frac{2\pi r}{\omega} \quad \omega = \frac{V_1}{2\pi r} = 14,16 \text{ 1/c}$$

$$P = \frac{dA}{dt} = F \frac{dL}{dt} = Fv$$

$$F_{\text{тр}} = \mu N = \mu p \pi r^2 \omega = 37,699 \text{ Н}$$

$$P = F_{\text{тр}} \cdot \omega \cdot r = 10,676 \text{ Вт}$$

$$P_{\text{по}} = \frac{1}{0,6} P = 17,8 \text{ Вт}$$

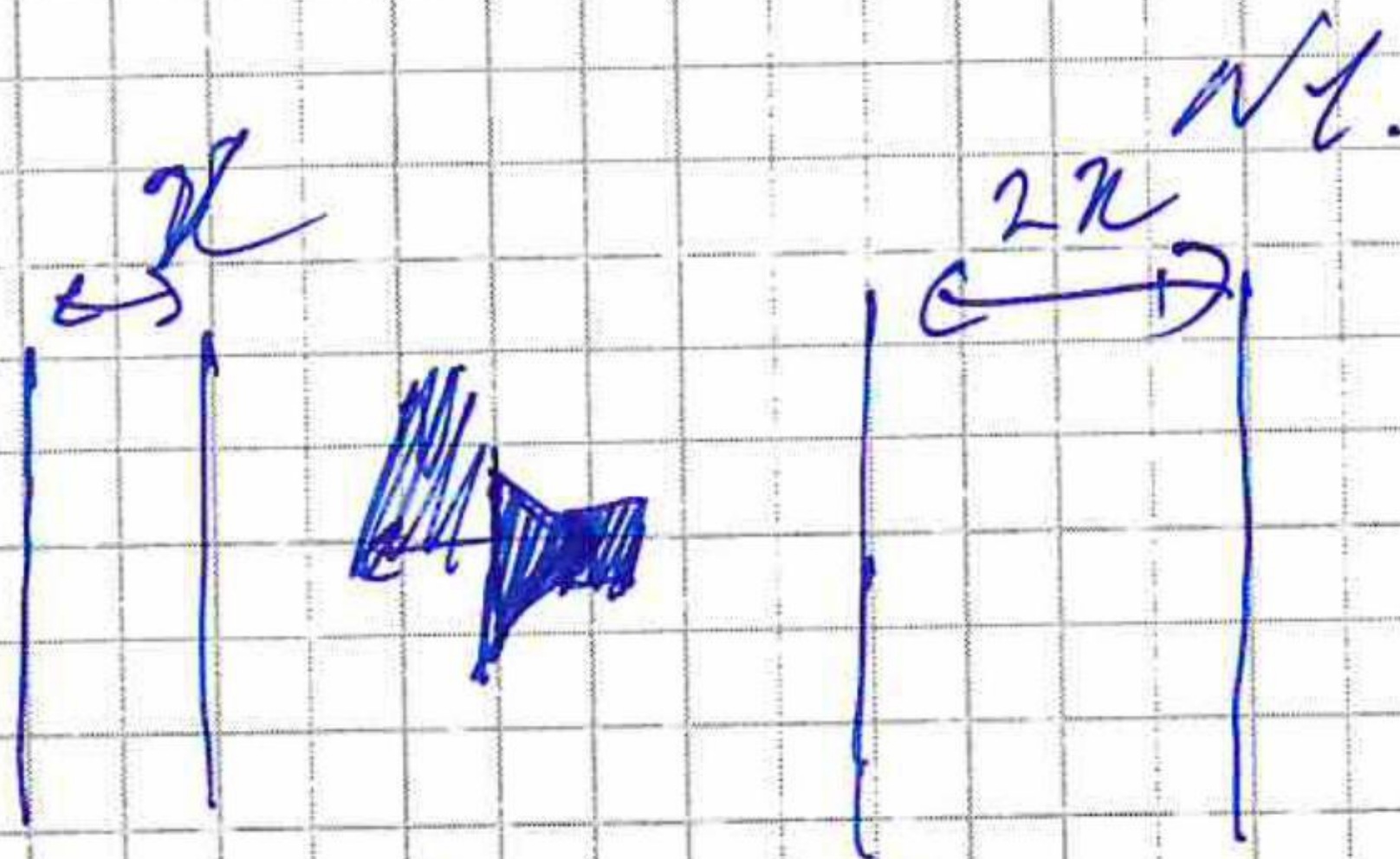
$$P' = 1,5 P$$

$$\omega_2 = \frac{V_2}{2r} = 8,58 \text{ 1/c}$$

$$I = \frac{P'}{U \cdot n'} = 0,2 \text{ А}$$

$$n' = n \cdot \frac{V_2}{V_1}$$

ОТВ: 17,8 Вт; 0,2 А.



$$x = t \cdot (v_{zb} - v_n)$$

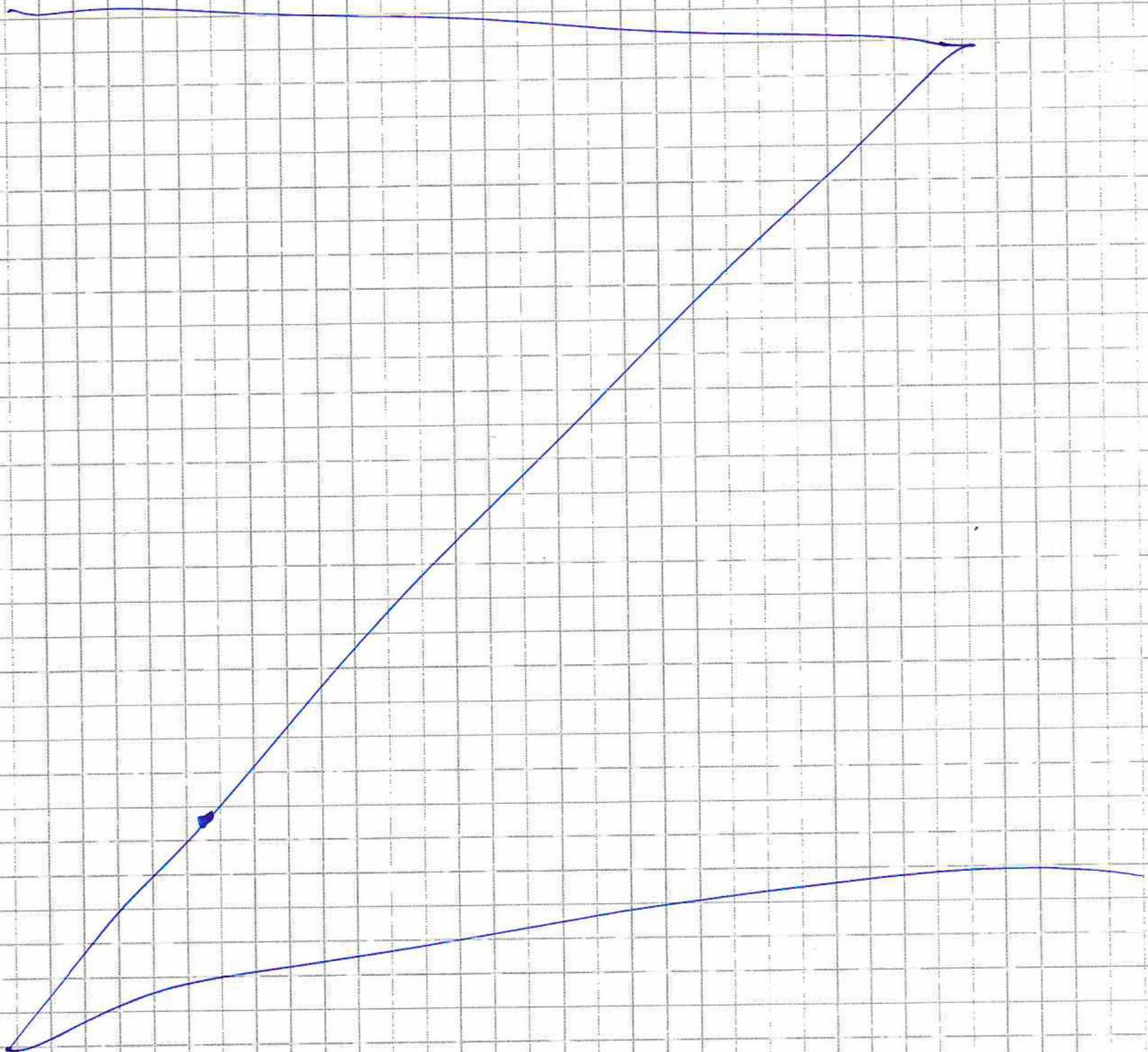
$$2x = t \cdot (v_{zb} + v_n)$$

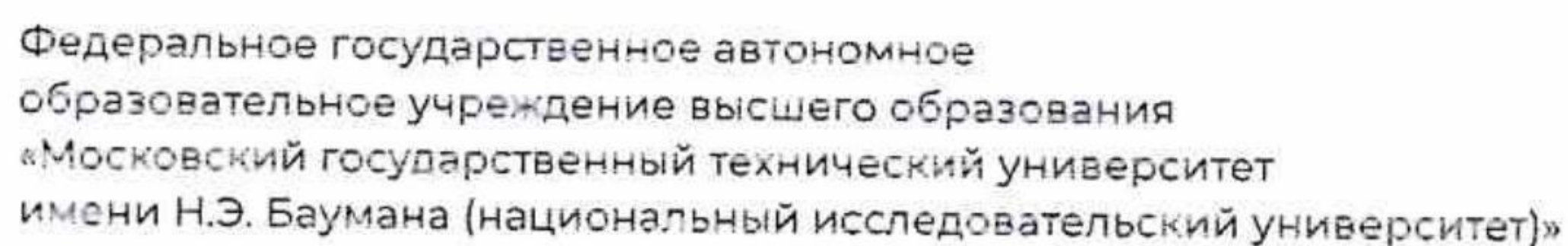
$$v_{zb} = 3v_n$$

$$v_n = \frac{v_{zb}}{3} = 333 \text{ км/ч.}$$

если это звук в воздухе.

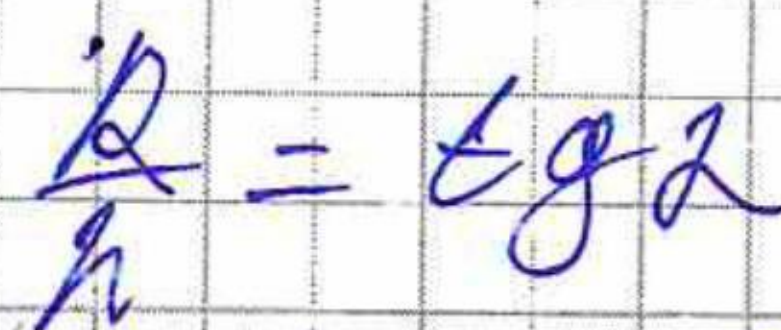
если это свет: $v_n = \frac{v_{zb}}{3} = 10^8 \text{ м/с}$ \leftarrow Амв.





Вариант задания

Лист работы 5 из



$$h = \frac{R}{Eg_2}$$

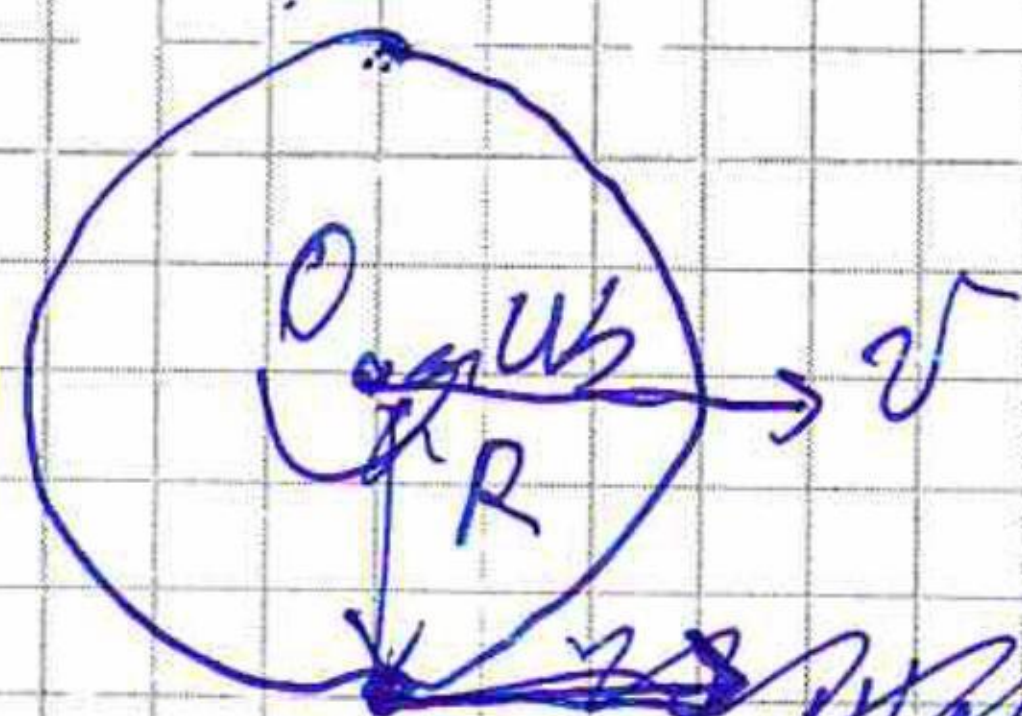
$$H = \sin \alpha \cdot h = R \cdot \cos \alpha$$

$$L = \frac{R}{\sin \alpha}$$

$$W_f = \frac{V}{L - H_{\text{tgd}}} =$$

$$= \frac{V}{\frac{R}{\sin \alpha} - \frac{R \sin \alpha}{\cancel{\sin \alpha}}} = \frac{V \sin \alpha}{R(1 - \sin^2 \alpha)} = \frac{V \sin \alpha}{R \cos^2 \alpha}$$

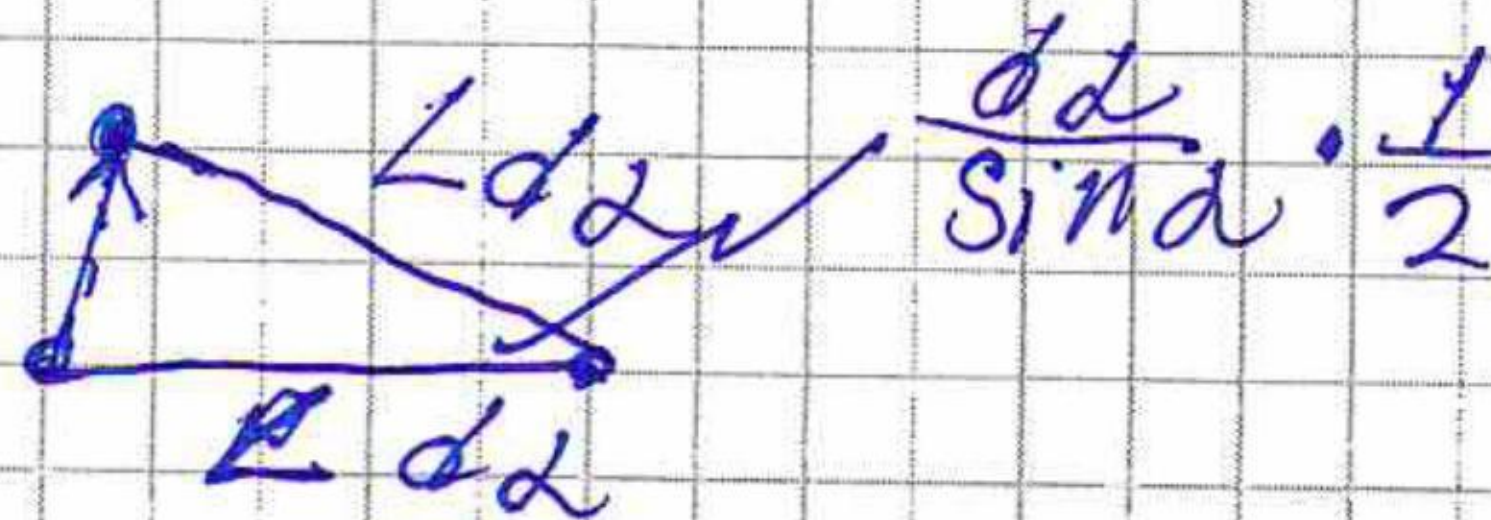
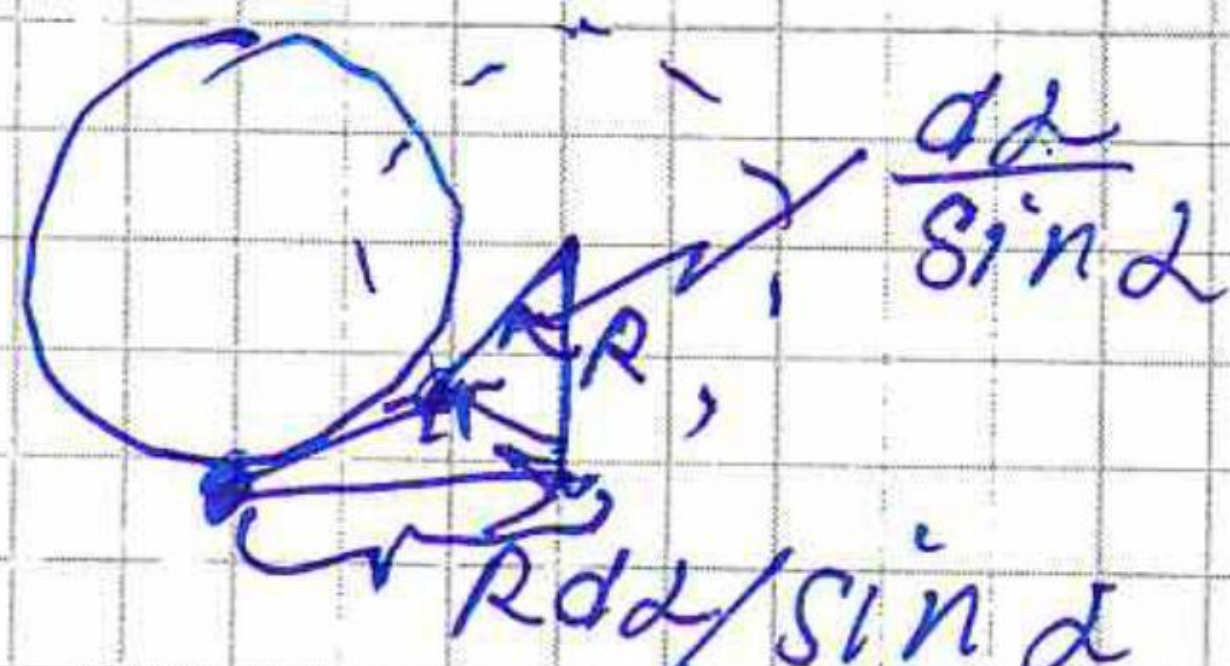
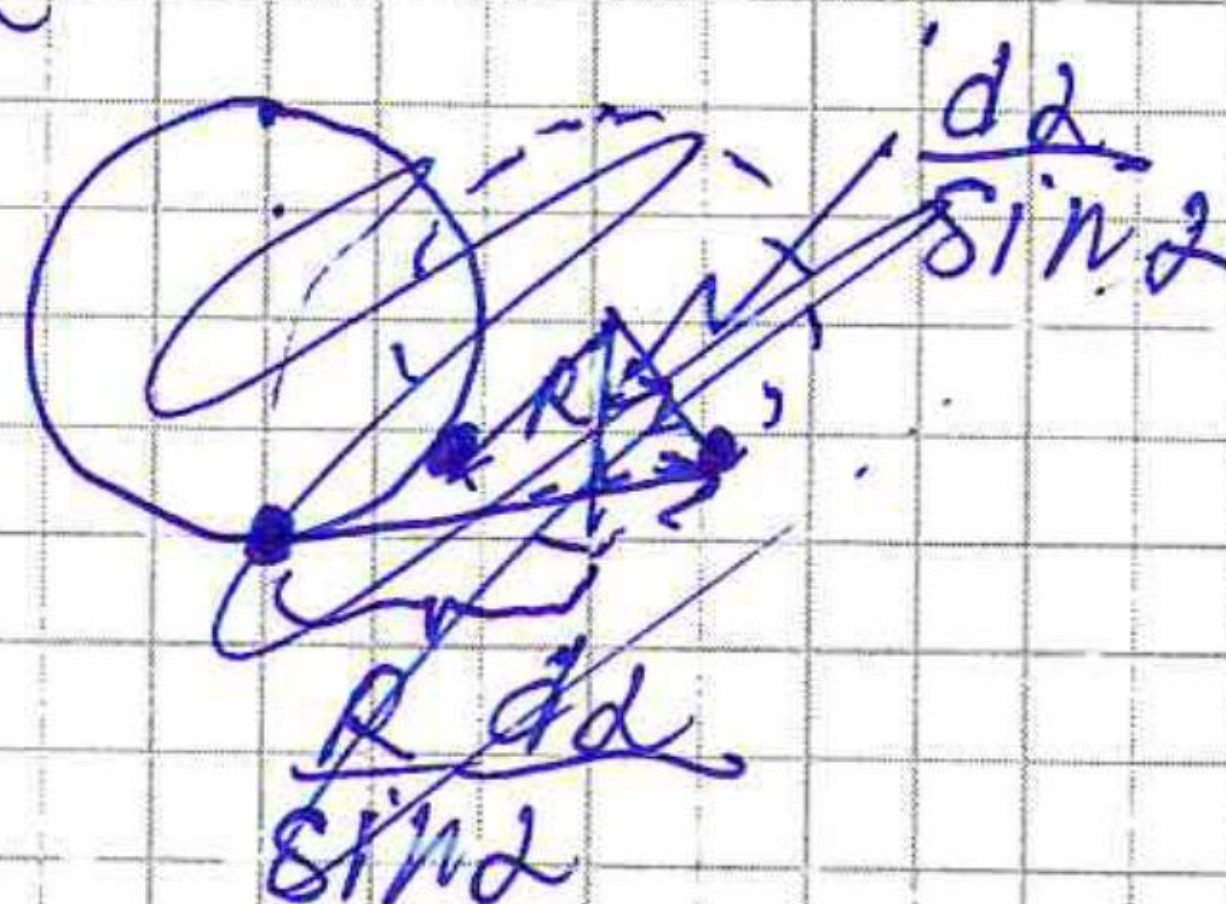
~~W. F. R.~~ B.C.O.T.O



$$W_2 = \frac{V}{\cos^2 \alpha} - V =$$

$$= \frac{U}{R} \frac{\sin^2 \alpha}{\cos^2 \alpha} = \frac{U}{R} = \operatorname{tg}^2 \alpha$$

$$w_f L = \frac{V}{\mu \cos^2 \alpha}$$



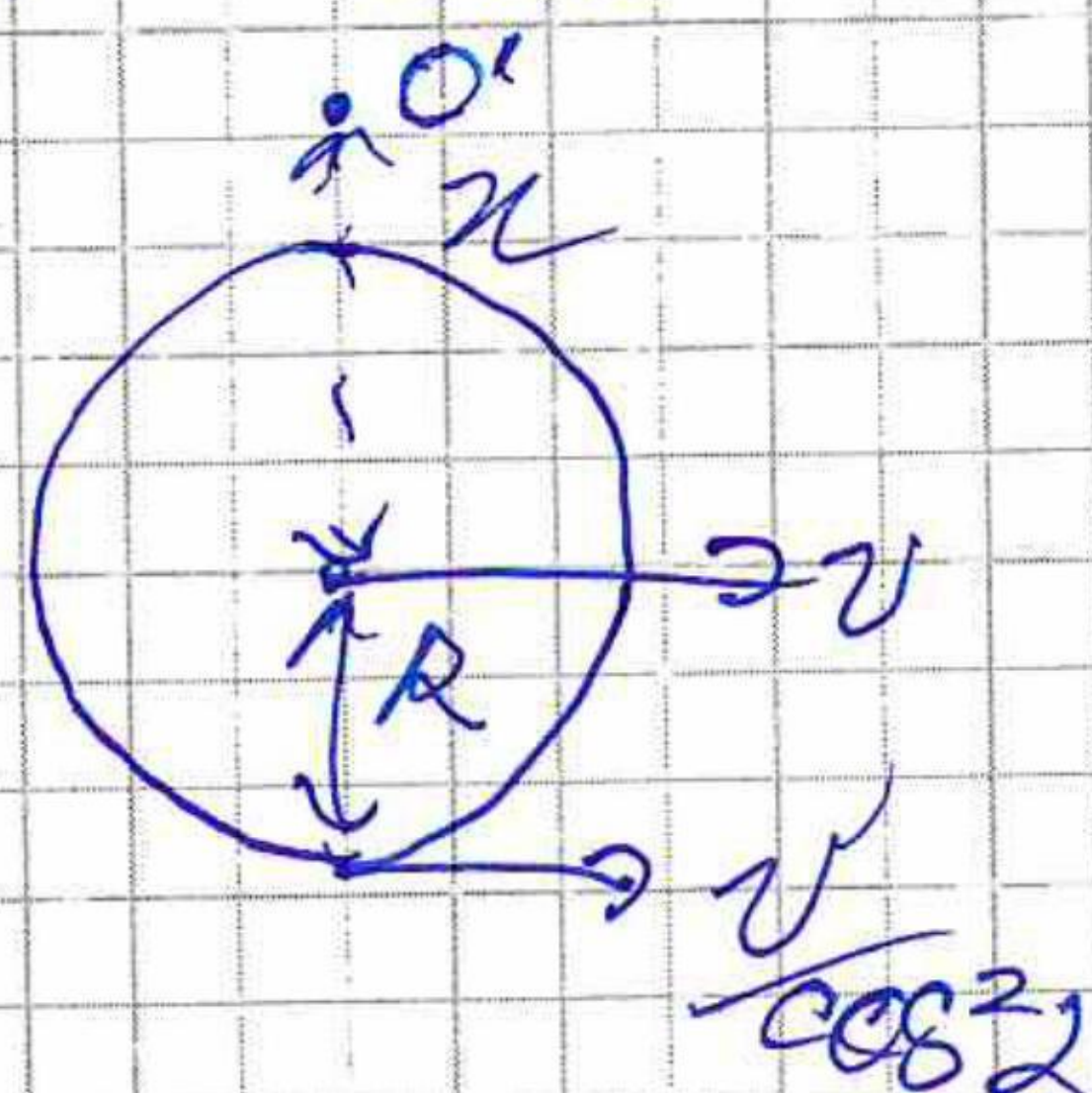
$$w = \frac{dd}{dt}$$

$$w = \frac{v}{R}$$

$$w' = \frac{dw}{dt} = \frac{dv}{dt} \cdot \frac{1}{R} = \frac{a}{R}$$

$$w_1' = \frac{a \sin \alpha}{R \cos^2 \alpha}$$

$$w_3 = \frac{v}{r}$$



$$w_3 = \frac{v}{\cos^2 \alpha (r + R)}$$

$$r = \frac{R \cos^2 \alpha}{\sin^2 \alpha}$$

$$w_3 = \frac{v}{R} \tan^2 \alpha$$

Ans: $w_1 = \frac{v}{R} \frac{\sin \alpha}{\cos^2 \alpha}$; $w_2 = w_3 = \frac{v}{R} \tan^2 \alpha$;

$$w_1' = \frac{a}{R} \frac{\sin \alpha}{\cos^2 \alpha} = \frac{v^2}{R^2} \frac{\sin^3 \alpha}{\cos^6 \alpha}$$

$$a = \frac{w_1^2}{R} = \frac{v^2 \sin^2 \alpha}{R \cos^4 \alpha}$$

