

F1 LS 2024 opravná písomka - riešenie

1. $x(t) = x_0 + \frac{1}{2}at^2 - \frac{1}{3}bt^3$

$$x_0, a, b > 0$$

$$t_1, x_1$$

$$v(t) = \frac{dx}{dt} = at - bt^2 = (a - bt)t$$

$$v(t_1) = 0 \Rightarrow a - bt_1 = 0 \quad t_1 = \frac{a}{b}$$

$$x_1 = x(t_1) = x_0 + \frac{1}{2}a\frac{a^2}{b^2} - \frac{1}{3}b\frac{a^3}{b^3}$$

$$x_1 = x_0 + \frac{1}{6}\frac{a^3}{b^2}$$

2. $J_T = \frac{1}{12}ml^2$

$$J_j$$

$$\frac{T \quad l/2}{|}$$

$$J = 3J_1$$

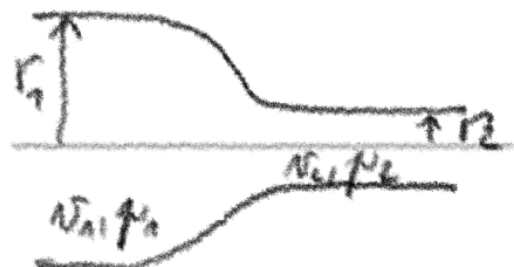


$$J_1 = J_T + \frac{1}{2}ml^2 = \frac{1}{12}ml^2 + \frac{1}{2}ml^2 = \frac{1}{3}ml^2$$

$$J = 3 \cdot \frac{1}{3}ml^2 = ml^2$$

3. $r_1; v_1; r_2 < r_1; p_2, P$

$$p_1$$



$$\frac{1}{2}\rho v_1^2 + p_1 = \frac{1}{2}\rho v_2^2 + p_2$$

$$p_1 = p_2 + \frac{1}{2} \rho (v_2^2 - v_1^2)$$

$$S_1 v_1 = S_2 v_2 \quad \Rightarrow \quad \pi r_1^2 v_1 = \pi r_2^2 v_2$$

$$v_2 = \frac{r_1^2}{r_2^2} v_1 \quad v_2^2 - v_1^2 = \left(\frac{r_1^4}{r_2^4} - 1 \right) v_1^2$$

$$p_1 = p_2 + \frac{1}{2} \rho v_1^2 \left(\frac{r_1^4}{r_2^4} - 1 \right) \quad p_1 > p_2$$

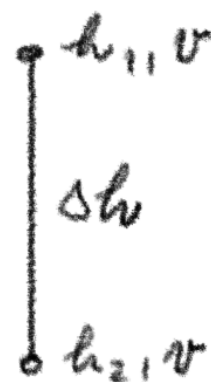
$$\textcircled{4.} \quad \frac{m_1 W_1 \Delta h}{m}$$

$$m g h_1 + \frac{1}{2} m v^2 = m g h_2 + \frac{1}{2} m v^2 - W$$

$$m g (h_1 - h_2) = -W$$

$$m g \Delta h = -W$$

$$m = - \frac{W}{g \Delta h}$$



(práca odporovej sily
je záporná $\rightarrow$ vzbudí sa
sila pôsobiaca na parašutistu)