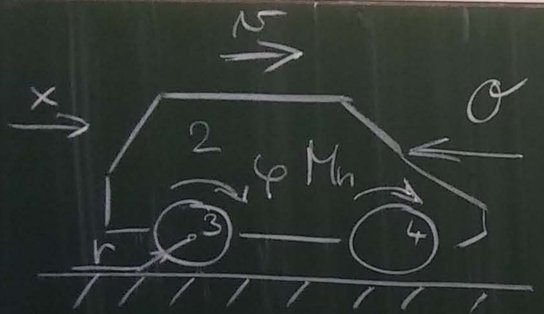

$$m_{red}\ddot{q} + \frac{1}{2}\frac{dm_{red}}{dq}\dot{q}^2 = Q$$

$$\frac{1}{2}m_{red}\dot{q}^2 = \frac{1}{2}m_2\dot{x}^2 + \frac{1}{2}m_3\dot{x}^2 + \frac{1}{2}m_4\dot{x}^2 + \frac{1}{2}I_{3S_3}\dot{\varphi}^2 + \frac{1}{2}I_{4S_4}\dot{\varphi}^2 \quad ; q = x,\ x = \varphi r \rightarrow \dot{\varphi} = \frac{\dot{x}}{r}$$

$$\frac{1}{2}m_{red}\dot{x}^2 = \frac{1}{2}(m_2+m_3+m_4)\dot{x}^2 + \frac{1}{2}\left(\frac{I_{3S_3}}{r^2} + \frac{I_{4S_4}}{r^2}\right)\dot{x}^2$$

$$\boxed{m_{red} = m_2+m_3+m_4+\frac{1}{r^2}(I_{3S_3}+I_{4S_4})} \rightarrow \frac{dm_{red}}{dx} = 0$$

D: $r, m_2, m_3, m_4, I_{3S_3}, I_{4S_4}, M_h, \sigma = k_2 v_2^2$

U: VPR

$$Q\,dq = M_h\,d\varphi - \sigma\,dx \Rightarrow Q\,dx = M_h\frac{1}{r}dx - k_2\dot{x}^2dx \Rightarrow Q = \frac{M_h}{r} - k_2\dot{x}^2$$

$$\boxed{m_{red}\ddot{x} = \frac{M_h}{r} - k_2\dot{x}^2}$$

Na jaké dráze L zrychlí "z 0 na 100"

$$a = \frac{d(v^2)}{2dx} \Rightarrow m_{red}\frac{d(v^2)}{2dx} = \frac{M_h}{r} - k_2v^2 \rightarrow m_{red}\int_0^{v_{100}^2}\frac{d(v^2)}{\frac{M_h}{r}-k_2v^2} = 2\int_0^L dx \rightarrow L = \frac{m_{red}}{2k_2}\ln\left|\frac{1}{1-\frac{k_2 r}{M_h}v_{100}^2}\right|$$