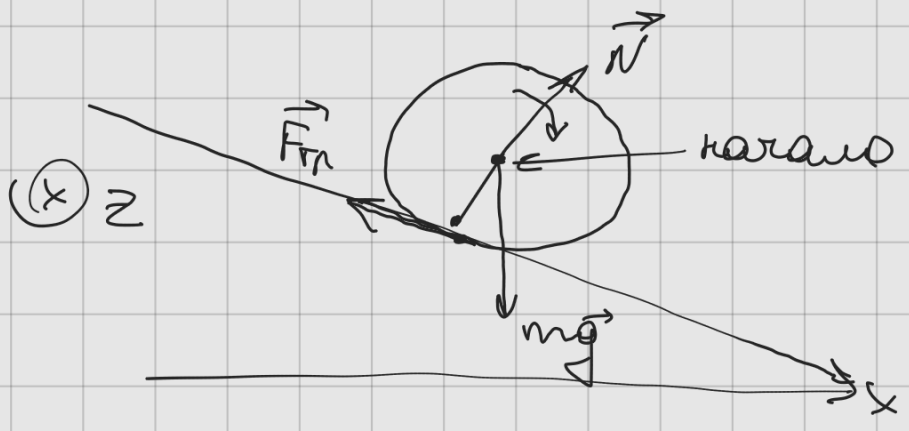
№50

Решение:



$$L_z = \underbrace{L_{y M,z}}_{0} + L_{отн.y M,z} = 0 + I\omega = I\omega, \; I = \frac{mR^2}{2}$$

$$M_z = R \cdot F_{тр}$$

- $\frac{dL_z}{dt} = M_z \Rightarrow R \cdot F_{тр} = I\frac{d\omega}{dt}$

- Условие качения: $v = \omega R \Rightarrow a = \frac{d\omega}{dt} R$

$$R \cdot F_{тр} = I \cdot \frac{a}{R}$$

- II З-н Н. на x: $ma = mg\sin\alpha - \mu mg\cos\alpha$

$$ma = mg\sin\alpha - F_{тр}$$

$$a = g\sin\alpha - \frac{F_т}{m}$$

$$R^2 \cdot F_т = I \cdot (g\sin\alpha - \frac{F_т}{m})$$

$$\left(R^2 + \frac{I}{m}\right) F_T = I g \sin\alpha$$

$$F_T = \frac{I g \sin\alpha}{R^2 + \frac{I}{m}} = \frac{\frac{mR^2}{2} \cdot g \sin\alpha}{R^2 + \frac{R^2}{2}} = \frac{\frac{m}{2} g \sin\alpha}{\frac{3}{2}} = \frac{mg\sin\alpha}{3}$$

$$mgR\sin\alpha = I\frac{a}{R} + maR$$

$$mg\sin\alpha - F_{Tp} = ma$$

$$mgR\sin\alpha = \frac{I}{R} \cdot \left(\frac{mg\sin\alpha - F_{Tp}}{m}\right) + mR\left(g\sin\alpha - \frac{F_T}{m}\right)$$

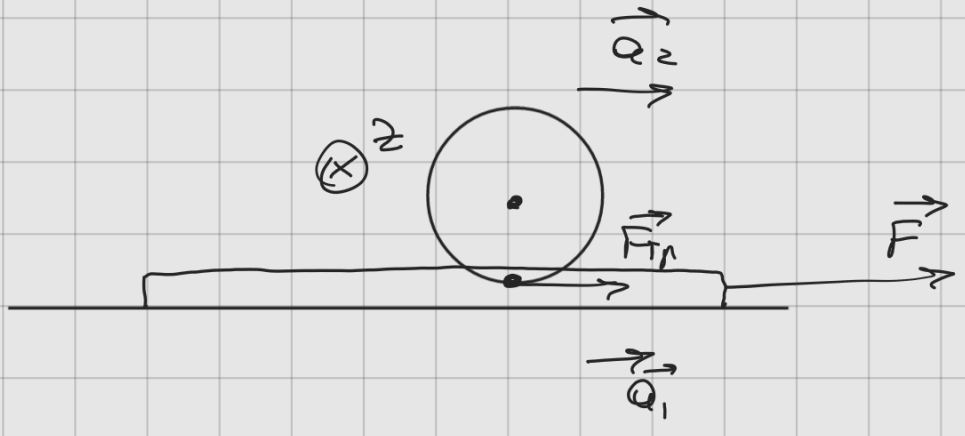
$$mgR\sin\alpha = \frac{mR}{2}\left(g\sin\alpha - \frac{F_T}{m}\right) + mR\left(g\sin\alpha - \frac{F_T}{m}\right)$$

$$g\sin\alpha = \frac{g\sin\alpha}{2} - \frac{F_T}{2m} + g\sin\alpha - \frac{F_T}{m}$$

$$+\frac{g\sin\alpha}{2} = +\frac{3}{2}\frac{F_T}{m} \rightarrow F_T = \frac{mg\sin\alpha}{3}$$

№51

Решение:



1) $F = m_1 a_1 + m_2 a_2$

2) $F_{тр} = m_2 a_2 \rightarrow a_2 = \frac{F_{тр}}{m_2}$

3) $M_z = \frac{dL_z}{dt}$, $L_z = L_{у.м} + L_{отн.у.м}$

$L_{отн.у.м} = I\omega \Rightarrow \frac{dL_z}{dt} = I\frac{d\omega}{dt}$

$a_2 = a_1 - a_0$

$F_{тр} R = I\frac{a_0}{R} \Rightarrow \frac{2m_2 R^2 \cdot a_0}{R}$ $\quad a_0 = \frac{5F_{тр}}{2m_2}$

$a_1 = \frac{7F_{тр}}{2m_2}$

$F = \frac{7F_{тр}m_1}{2m_2} + m_2 \cdot \frac{F_{тр}}{m_2} = \frac{7F_{тр}m_1 + 2m_2F_{тр}}{2m_2} =$

$F - F_{тр} = m_1 a_1$

$F = F_{тр} + \frac{7m_1F_{тр}}{2m_2} \Rightarrow F_{тр} = \frac{F}{1+\frac{7m_1}{2m_2}} = \frac{2Fm_2}{2m_2+7m_1}$

$F = F_{тр} + m_1 \cdot \frac{7F_{тр}}{2m_2}$

$F = m_1 \cdot \frac{7F_{тр}}{2m_2} + \frac{m_2 \cdot F_{тр}}{m_2}$

$$F - F_{Tp} = m_1 a_1 \Rightarrow F_{Tp} = F - m_1 a_1$$

$$F - F_{Tp} = m_1 \cdot \frac{F - F_{Tp}}{2 m_2}$$

$$F_{Tp} = \frac{F}{1 + \frac{7}{2}\frac{m_1}{m_2}}$$

$$F = m_1 a_1 + m_2 a_2 \qquad a_2 = a_1 - a_0$$

$$F - F_{Tp} = m_1 a_1$$

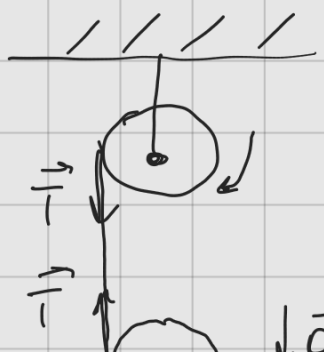
$$F_{Tp} = m_2 a_2 \rightarrow a_2 = \frac{F_T}{m_2}$$

$$F_T \cdot R = I \cdot \frac{a_0}{R} \rightarrow a_0 = \frac{F_T R^2}{I} = \frac{F_T \cdot R^2}{\frac{2}{5} m_2 R^2} = \frac{5 F_T}{2 m_2}$$

$$a_1 = \frac{7F}{2m_2 \cdot \left(1 + \frac{7m_1}{2m_2}\right)} = \frac{7F}{2m_2 + 7m_1}$$

$$a_2 = \frac{F_{Tp}}{2m_2} = \frac{F}{m_2\left(1 + \frac{7m_1}{2m_2}\right)} = \frac{F}{m_2 + \frac{7m_1}{2}}$$

N52



$$T - mg = -ma$$

$$T \cdot R = \frac{mR^2}{2} \cdot \frac{a_1}{R}$$

$$T \cdot R = \frac{mR^2}{2} \cdot \frac{a_2}{R}$$

$$T = \frac{m a_1}{2} \Rightarrow a_1 = \frac{2T}{m}$$

$$a_2 = \frac{2T}{m}$$

$$a = a_1 + a_2 = \frac{4T}{m} \Rightarrow T - mg = -4T$$

$$5T = mg$$

$$T = \frac{mg}{5}$$

$$a = \frac{4}{5}g$$