Musterlösung Aufgabe 4-4 (Energiesatz und d'Alembert

Aufg. 4-4 (Energiesatz)

$$M_0 \cdot \varphi - m_2 \cdot g \cdot \mu \cdot s = \frac{1}{2}(m_1 + m_2)\, v^2 + \frac{1}{2} J_1 \omega_1^2$$

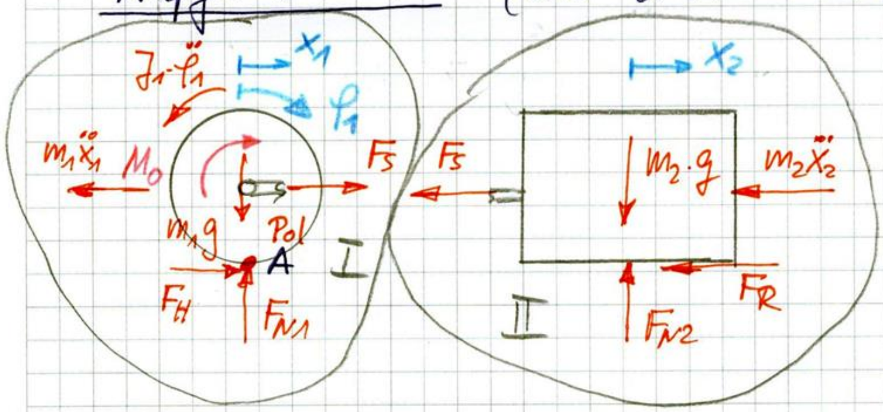
$$v_1 = v_2 = v$$

Rollbed. $\boxed{\omega_1 = \frac{v}{r}}$; $s = r \cdot \varphi$, $v = r \cdot \omega_1$ $\Rightarrow \boxed{\varphi = \frac{s}{r}}$

Massentr. $J_1 = \frac{1}{2} m_1 \cdot r^2$

$$M_0 = 2{,}39\ \mathrm{Nm}$$

Aufgabe 4-4 (als d'Alembert-Aufg.)



$M_0 = 2{,}4\ \mathrm{Nm}$

Ges: $\ddot{x}$

$$\mathrm{I}: \curvearrowleft A: \quad J_1 \ddot{\varphi}_1 + m_1 \ddot{x}_1 \cdot r - M_0 - F_S \cdot r = 0 \qquad (1)$$

$$\mathrm{II}: \rightarrow: \quad -F_S - m_2 \ddot{x}_2 - F_R = 0 \qquad (2)$$

$$\uparrow: \quad F_{N2} - m_2 \cdot g = 0 \Rightarrow F_{N2} = m_2 \cdot g$$

Coulomb: $F_R = \mu \cdot F_N = \mu \cdot m_2 \cdot g$

(2): $F_S = -m_2 \ddot{x}_2 - \mu \cdot m_2 \cdot g$

$$J_1 \ddot{\varphi}_1 + m_1 \ddot{x}_1 \cdot r - M_0 + m_2 \ddot{x}_2 \cdot r + \mu \cdot m_2 \cdot g \cdot r = 0$$

Zwangsbed. $\ddot{x}_1 = \ddot{x}_2 = \ddot{x}$; $\ddot{\varphi}_1 = \frac{\ddot{x}}{r}$

$J_1 = \frac{1}{2} m_1 r^2$

$$\ddot{x} = 4{,}01\ \frac{\mathrm{m}}{\mathrm{s}^2}$$