# Musterlösungen Aufgaben 4-10 und 4-11

## Aufgabe 4-10

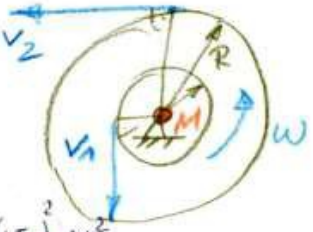
$W_{pot(m_1)} + 0 - 0 = W_{kin,tr(m_1)} + W_{kin,tr(m_2)} + W_{kin,rot(Rolle)}$

$m_1 \cdot g \cdot h_1 = \frac{1}{2} m_1 \cdot v_1^2 + \frac{1}{2} m_2 \cdot v_2^2 + \frac{1}{2} J_A \cdot \omega^2$

Zwangsbed.: $v_2 = f(v_1)$ ; $\omega = f(v_1)$

$\frac{v_2}{R} = \frac{v_1}{r} = \omega$ ; $\boxed{\omega = \frac{v_1}{r}}$

$\boxed{v_2 = v_1 \cdot \frac{R}{r} = 1{,}5\, v_1}$

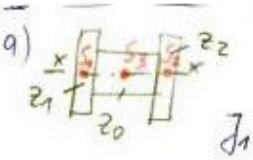



$m \cdot g \cdot h_1 = \frac{1}{2} m v_1^2 + \frac{1}{2} 4m \cdot (1{,}5 v_1)^2 + \frac{1}{2} \cdot 2m \cdot (1{,}5r)^2 \cdot \frac{v_1^2}{r^2}$

$= v_1^2 \left( \frac{1}{2} + \frac{4}{2} \cdot 1{,}5^2 + 1{,}5^2 \right)$

$g h_1 = v_1^2 \cdot 7{,}25 \Rightarrow v_1 = \sqrt{\frac{9{,}81 \frac{m}{s^2} \cdot 0{,}15 m}{7{,}25}} = 0{,}451 \frac{m}{s}$

## Aufgabe 4-11

a) 


$m_1 = m_2 = m$ ; $R = 2r$ ; $m_1 = 8m$

$m_0 = 6m$

$J_1 = 2 \cdot J_{1'} + J_0 = \frac{1}{2} m \cdot R^2 \cdot 2 + \frac{1}{2} 6m \cdot r^2$

$J_1 = m \cdot (2r)^2 + 3mr^2$

$J_1 = 1{,}25 \cdot 4r^2 + 3mr^2 = 8mr^2$

b) $W_{①} + W_{zu} - W_{ab} = \Sigma W_{②}$

$W_{pot(m_2)} + 0 - 0 = W_{kin,tr(m_1)} + W_{kin,rot(m_1)} + W_{kin,tr(m_2)}$

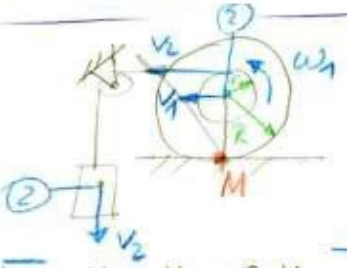
$m_2 \cdot g \cdot s = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} J_1 \cdot \omega_1^2 + \frac{1}{2} m_2 v_2^2$

$v_1 = f(v_2)$ ; $\omega_2 = f(v_2)$

Zwangsbed.

$\frac{v_2}{R+r} = \frac{v_1}{R} \Rightarrow v_1 = v_2 \frac{R}{R+r}$

$\boxed{v_1 = v_2 \cdot \frac{2r}{3r} = \frac{2}{3} v_2}$




Rad 2 rollt: $v_1 = \omega_1 \cdot R \Rightarrow \boxed{\omega_1 = \frac{v_1}{R} = \frac{v_1}{2r} = \frac{2}{3} \frac{v_2}{2r} = \frac{v_2}{3r}}$

$8m \cdot g \cdot s = \frac{1}{2} 8m \cdot \left( \frac{2}{3} v_2 \right)^2 + \frac{1}{2} 8mr^2 \cdot \left( \frac{v_2}{3r} \right)^2 + \frac{1}{2} 8m \cdot v_2^2$

$g \cdot s = \frac{1}{2} v_2^2 \left( \frac{1}{2} \cdot \frac{4}{9} + \frac{1}{2} \cdot \frac{1}{9} + \frac{1}{2} \right)$

$g \cdot s = v_2^2 \left( 0{,}7 \right) \Rightarrow v_2 = \sqrt{\frac{9{,}81 \frac{m}{s^2} \cdot 1 m}{0{,}7}} = 3{,}55 \frac{m}{s}$