$$\dot{\vec{r}}_b = \begin{pmatrix} R\omega \sin(\omega t)\sin\theta - R\cos(\omega t)\,\dot{\theta}\cos(\theta) \\ -R\omega\cos(\omega t)\sin\theta - R\sin(\omega t)\,\dot{\theta}\cos(\theta) \\ -R\sin(\theta)\,\dot{\theta} \end{pmatrix}$$

$$|\dot{\vec{r}}_b|^2 = R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2\cos^2(\theta) + R^2\sin^2(\theta)\dot{\theta}^2$$
$$= R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2$$

für m_2: $|\dot{\vec{r}}_2|^2 = 2^2R^2\dot{\theta}^2\sin^2\theta$

$$L = T - V$$
$$= \frac{1}{2}m_1 2\left(R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2\right) + \frac{1}{2}m_2 4R^2\dot{\theta}^2\sin^2\theta$$
$$+2Rg\cos\theta(m_1+m_2)$$ ✓

c)

$m_2 = 0$

$$L = \frac{2}{2}m_1(R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2) + 2Rg\cos\theta\, m_1$$ ✓

$$\frac{\partial L}{\partial\theta} = 2m_1R^2\sin\theta\cdot\left(\omega^2\cdot\cos\theta - \frac{g}{R}\right)$$

$$\frac{\partial L}{\partial\dot{\theta}} = 2m_1R^2\cdot\dot{\theta} \qquad \frac{d}{dt}\frac{\partial L}{\partial\dot{\theta}} = 2m_1R^2\ddot{\theta}$$ ✓

$$\frac{d}{dt}\frac{\partial L}{\partial\dot{\theta}} - \frac{\partial L}{\partial\theta} = 0 = 2m_1R^2\ddot{\theta} - 2m_1R^2\sin\theta\left(\omega^2\cdot\cos\theta - \frac{g}{R}\right)$$
$$= \ddot{\theta} - \sin\theta\left(\omega^2\cdot\cos\theta - \frac{g}{R}\right)$$ ✓

d) $\theta \ll 1$

Das folgt nicht daraus.

$$\Rightarrow \ddot{\theta} - \theta\left(\omega^2 - \frac{g}{R}\right) = 0 \quad \Rightarrow \omega^2 < \frac{g}{R}$$ (✓)

e) $$\ddot{\theta} - 2\sin\theta\underbrace{\left(\omega^2\cdot\cos\theta - \frac{g}{R}\right)}_{=0} \Rightarrow \theta = \arccos\left(\frac{g}{\omega^2R}\right)$$ (✓)

das ist nur eine Lösung.

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~~3.5~~ 15