$$\tilde{E} = \left(\frac{m_1}{2} \ell + \frac{m_2}{2} \ell \sin^2\vartheta \right) \dot{\vartheta}^2$$

$$(m_1+m_2) g \cos\vartheta$$

$$\boxed{\dot{\vartheta}^2 = \frac{2(\tilde{E} + (m_1+m_2) g \cos\vartheta}{\ell (m_1 + m_2 \sin^2\vartheta)}}$$

Problem gelöst !

Kleine Schwingungen

$$\vartheta \ll 1 \quad , \quad \cos\vartheta = 1 - \frac{\vartheta^2}{2}$$

$$\dot{\vartheta}^2 = \frac{2(\tilde{E} + (m_1+m_2)g) - (m_1+m_2) g \vartheta^2}{\ell m_1 \left(1 + \frac{m_2}{m_1} \vartheta^2\right)}$$

$$\ell m_1 \dot{\vartheta}^2 + (m_1+m_2) g \vartheta^2 = \varepsilon$$

$$\vartheta = a \cos(\omega t + \alpha) \quad , \quad \omega^2 = \frac{m_1+m_2}{m_1} \frac{g}{\ell}$$