$+ II : \ell(m_1\ddot{q}_1 + m_2\ddot{q}_2) + g(m_1 q_1 + m_2 q_2) = 0$

$a_{11} = m_1 \qquad a_{12} = m_2 \qquad \Psi_1 = m_1 q_1 + m_2 q_2 \checkmark$

$\Rightarrow \ell\ddot{\Psi}_1 + g\Psi_1 = 0$

Mit Normierung wäre noch schöner $\quad$ Ib

$I - II : \ell(m_1\ddot{q}_1 - m_2\ddot{q}_2) + g(m_1 q_1 - m_2 q_2) + 2K\ell(q_1 - q_2) = 0 \qquad +\frac{1}{m_1} \cdot \frac{1}{m_2}$

$\ell\left(\frac{\ddot{q}_1}{m_2} - \frac{\ddot{q}_2}{m_1}\right) + g\left(\frac{q_1}{m_2} - \frac{q_2}{m_1}\right) + 2K\ell\left(\frac{q_1}{m_1 m_2} - \frac{q_2}{m_1 m_2}\right) = 0$

$I \cdot m_2 - II \cdot m_1:$

$m_1 m_2 \ell(\ddot{q}_1 - \ddot{q}_2) + g m_1 m_2(q_1 - q_2) + K\ell(m_1 + m_2)(q_1 - q_2)$

$\rightarrow a_{21} = 1 \quad , \quad a_{22} = -1 \qquad \Psi_2 = q_1 - q_2 \checkmark$

$\Rightarrow m_1 m_2 \ell\ddot{\Psi}_2 + \Psi_2 \cdot (g m_1 m_2 + K\ell(m_1 + m_2)) = 0 \qquad II\,b$

Ansatz: $\Psi_1 = A_1 e^{i\omega t} \qquad\qquad \Psi_2 = A_2 e^{i\omega t}$

$\left.\begin{array}{l} \text{bzw.} \\ \ddot{\Psi}_2 + \Psi_2 \cdot \left(\frac{g}{\ell} + K\frac{m_1 + m_2}{m_1 m_2}\right) \\ \qquad\qquad = 0 \end{array}\right.$

$\overset{Ib}{\Rightarrow} -A_1 \omega^2 e^{i\omega t} + \frac{g}{\ell} A_1 e^{i\omega t} = 0$

$\Rightarrow \omega_{1/2} = \pm\sqrt{g/\ell} \checkmark \Rightarrow \Psi_1 = A_{11} e^{i\sqrt{g/\ell}\,t} + A_{12} e^{-i\sqrt{g/\ell}\,t}$

$\underset{\Longrightarrow}{IIb}$

$\omega_{3/4} = \pm\sqrt{\frac{g}{\ell} + K\frac{m_1 + m_2}{m_1 m_2}} \checkmark \Rightarrow \Psi_2 = A_{21} e^{i\sqrt{\frac{g}{\ell} + K\ldots}} + A_{22} e^{-i\sqrt{\ldots}}$

c) $t = 0 :\, \Psi_1 = m_1 \cdot 0 + m_2 \cdot \hat{\varphi} = A_{11} e^0 + A_{12} \cdot e^0$ gut

Anfangsbed.

sind für φ und nicht für Ψ gegeben

$\Rightarrow A_{11} = m_2 \hat{\varphi} - A_{12}$

$\dot{\Psi}_1(t=0) = m_1 \dot{q}_1(t=0) + m_2 \dot{q}_2(t=0) = 0$

$\Leftrightarrow 0 = A_{11}\, i\omega + A_{12}(-i)\omega \qquad |\cdot i \; |\cdot \frac{1}{\omega}$

$\underset{\sqrt{g/\ell}}{\uparrow}$

$\Leftrightarrow A_{11} = A_{12} \Rightarrow A_{11} = A_{12} = \frac{1}{2} m_2 \hat{\varphi}$

• $\Psi_2(t=0) = -\hat{\varphi} = A_{21} + A_{22}$

$\dot{\Psi}_2(t=0) = 0 \Rightarrow A_{21} = A_{22}$ $\left.\begin{array}{l}\\ \end{array}\right\} \Rightarrow A_{21} = A_{22} = -\frac{1}{2}\hat{\varphi}$