

MuLö

1

a)  $F = c \cdot a (\varphi_1 - \varphi_2)$  (1)

b)  $\Theta^A \ddot{\varphi}_1 = -mg l \varphi_1 - F \cdot a$

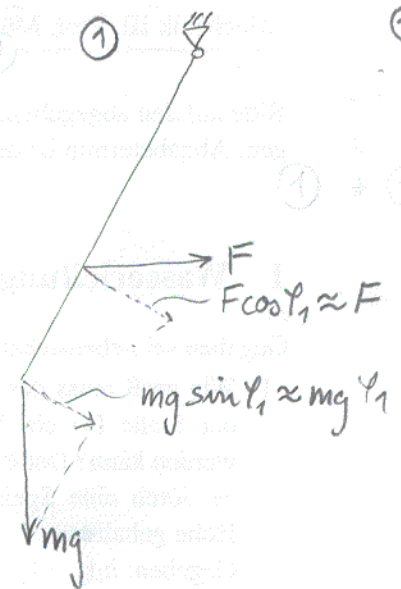
$\ddot{\varphi}_1 = -\frac{g}{l} \varphi_1 - \frac{ca^2}{me^2} (\varphi_1 - \varphi_2)$

$\ddot{\varphi}_1 + \frac{gml+ca^2}{me^2} \varphi_1 - \frac{ca^2}{me^2} \varphi_2 = 0$  (1)

$\Theta^B \ddot{\varphi}_2 = -mg l \varphi_2 + Fa$

$\ddot{\varphi}_2 + \frac{gml+ca^2}{me^2} \varphi_2 + \frac{ca^2}{me^2} \varphi_1 = 0$  (1)

Frühschnittsskizzen  
links: rechts:



c)  $\varphi_1(t) = A_1 e^{\lambda t}$      $\varphi_2(t) = A_2 e^{\lambda t}$

$$\begin{bmatrix} \lambda^2 + \frac{gml+ca^2}{me^2} & -\frac{ca^2}{me^2} \\ -\frac{ca^2}{me^2} & \lambda^2 + \frac{gml+ca^2}{me^2} \end{bmatrix} \begin{bmatrix} A_1 \\ A_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$
 (1)

$$\begin{bmatrix} \lambda^2 + \frac{g}{l} + \gamma & -\gamma \\ -\gamma & \lambda^2 + \frac{g}{l} + \gamma \end{bmatrix} \begin{bmatrix} A_1 \\ A_2 \end{bmatrix} = 0$$
     $\gamma = \frac{ca^2}{me^2}$

$(\lambda^2 + \frac{g}{l} + \gamma)(\lambda^2 + \frac{g}{l} + \gamma) - \gamma^2 = 0$  (1)

$\lambda^2 + \frac{g}{l} + \gamma = \gamma$

$\lambda^2 + \frac{g}{l} + \gamma = -\gamma$

$\lambda_{1,2} = \pm \sqrt{-\frac{g}{l}} = \pm i \sqrt{\frac{g}{l}}$  (1)

$\lambda_{3,4} = \pm \sqrt{-\frac{g}{l} + 2\gamma} = \pm i \sqrt{\frac{g}{l} + 2\gamma}$

d)  $\omega_1 = \sqrt{\frac{g}{l}}$  (1)

$$\begin{bmatrix} \gamma & -\gamma \\ -\gamma & \gamma \end{bmatrix} \begin{bmatrix} A_1 \\ A_2 \end{bmatrix} = 0$$

Setze  $A_1 = 1 \Rightarrow \gamma - \gamma A_2 = 0$

$1 = A_2$

$\underline{v}_1 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$  (1)