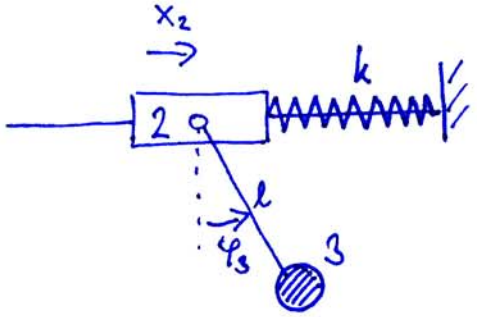

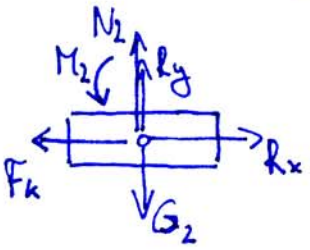

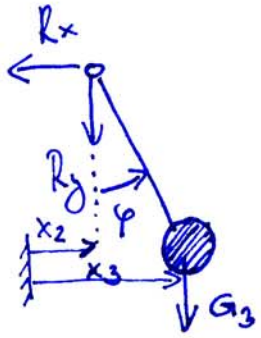

$x_3 = x_2 + l \cdot \sin\varphi$, $y_3 = l \cdot \cos\varphi$

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$x_3 = x_2 + l \cdot \varphi$, $y_3 = l$

$\ddot{x}_3 = \ddot{x}_2 + l \cdot \ddot{\varphi}$, $\ddot{y}_3 = 0$

$m_2 \ddot{x}_2 = R_x - F_k$

$\| \quad k \cdot x_2$

$m_3 \cdot \ddot{x}_3 = -R_x$

$m_3 \ddot{y}_3 = R_y + G_3$

$I_{S_3} \ddot{\varphi} = 0 = R_x \cdot l \cos\varphi + R_y \cdot l \sin\varphi = R_x \cdot l + R_y \cdot l \cdot \varphi$

$R_x = -m_3 (\ddot{x}_2 + l \cdot \ddot{\varphi})$

$0 = R_y + m_3 \cdot g \rightarrow R_y = -m_3 g$

$0 = -m_3 (\ddot{x}_2 + l \ddot{\varphi}) \cdot l - m_3 g \cdot l \cdot \varphi$

$m_2 \ddot{x}_2 = -m_3 \ddot{x}_2 - m_3 \cdot l \cdot \ddot{\varphi} - k \cdot x_2$

$0 = (m_3 \ddot{x}_2 + m_3 l \ddot{\varphi}) l + m_3 g l \varphi$

$$\begin{bmatrix} m_2 + m_3 & m_3 \cdot l \\ m_3 \cdot l & m_3 l^2 \end{bmatrix} \begin{bmatrix} \ddot{x}_2 \\ \ddot{\varphi} \end{bmatrix} + \begin{bmatrix} k & 0 \\ 0 & m_3 g l \end{bmatrix} \begin{bmatrix} x_2 \\ \varphi \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$