

問2. (1) $\begin{matrix} A \\ \downarrow \\ m v_0 \end{matrix} = \begin{matrix} B \\ \downarrow \\ m v \end{matrix} + \begin{matrix} A \\ \downarrow \\ m u \end{matrix}$ (前) (後) $\frac{m}{2} v_0^2 = \frac{m}{2} v^2 + \frac{m}{2} u^2$

$$\therefore v_0 - u = v, \quad v_0^2 - u^2 = (v_0 - u)(v_0 + u) = u^2 \quad \therefore v_0 + u = v$$

$$+ \frac{v_0 - u = v}{v_0 = v}$$

$\frac{l}{1 + e \cos(\theta + \lambda)} = \frac{l^2}{MG} \frac{d^2 \theta}{dt^2} = k$ $\therefore A: u=0, B: v=v_0 //$ (10)

(2) $\dot{X} = \frac{1}{2} v = \frac{1}{2} v_0 //$

$T = \frac{1}{2} 2m \dot{X}^2 = \frac{m}{4} v_0^2 //$ (10)

(3) $\dot{x} = v \quad \therefore T' = \frac{1}{2} m \dot{x}^2 = \frac{m}{4} v^2 = \frac{m}{4} v_0^2 //$ (10)

$\uparrow$
 $m = \frac{1}{2} m$

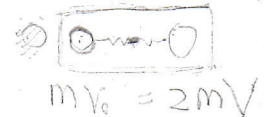
(4) $T_{\text{前}} = \frac{1}{2} m v_0^2 \frac{1}{m} + \frac{1}{m}$

$T_{\text{後}} = T + T' = \frac{m}{4} v_0^2 + \frac{m}{4} v_0^2 = \frac{m}{2} v_0^2 \quad \therefore T_{\text{前}} = T_{\text{後}} //$ (5)

$\uparrow$
(2), (3)

(5) $T' = \frac{m}{4} v_0^2 = \frac{1}{2} k a^2$ $\therefore$ 振幅 a はばね定数 k とバネの未ランシムエネルギー

$\therefore a = \sqrt{\frac{m}{2k}} v_0 //$ (5)



問3. (1) $F_{ix} = m_i g \quad F_{iy} = 0 \quad X = h \sin \phi$

$\therefore N_z = - \sum_i m_i x_i g = - M g X = - M g h \sin \phi //$ (5)

$\uparrow$
 $X = \sum_i m_i x_i / M$

(2) $L_z = I \dot{\phi}$ と $dL_z/dt = N_z$ より $I \ddot{\phi} = - M g h \sin \phi //$ (5)

(3) $\phi \approx 0$ とき $\sin \phi \approx \phi \quad \therefore I \ddot{\phi} \approx - M g h \phi \quad \text{or} \quad \ddot{\phi} = - \frac{M g h}{I} \phi$

$\therefore$ 角振動数 $\omega = \sqrt{\frac{M g h}{I}}$ の単振動。

$\therefore T = \frac{2\pi}{\omega} = 2\pi \sqrt{\frac{I}{M g h}} //$ (10)