

1

問 1

(1)

$$\begin{aligned} \text{時刻} &: \sqrt{\frac{2ML}{F}} \\ \text{速度} &: \sqrt{\frac{2FL}{M}} \end{aligned}$$

(2)

$$\begin{aligned} \text{箱} : Ma_M &= F - \mu mg \\ \text{物体} : ma_m &= \mu mg \end{aligned}$$

(3)

$$F_c = \mu_0(m+M)g$$

(4)

$$\begin{aligned} \text{時刻} &: \sqrt{\frac{2ML}{F - (m+M)\mu g}} \\ \text{座標} &: \frac{L}{2} \left\{ \frac{F - (m-M)\mu g}{F - (m+M)\mu g} \right\} \end{aligned}$$

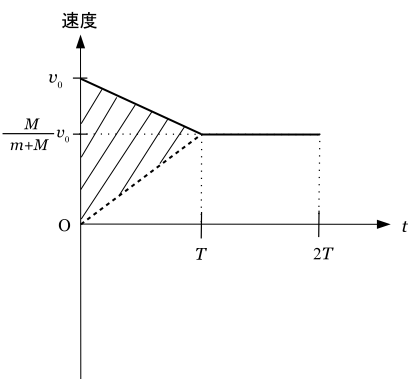
(5)

$$v_0 < \sqrt{\frac{2(m+M)\mu g L}{M}}$$

(6)

$$\begin{aligned} \text{距離} &: \frac{Mv_0^2}{2\mu g(m+M)} \\ T &= \frac{Mv_0}{(m+M)\mu g} \end{aligned}$$

(7)



問 2

(1)

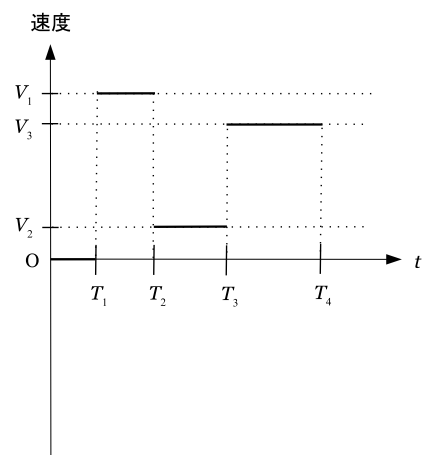
$$\begin{aligned} \text{物体} &: \frac{m+M(-e)^n}{m+M} v_0 \\ \text{箱} &: \frac{m\{1 - (-e)^n\}}{m+M} v_0 \end{aligned}$$

(2)

$$\begin{aligned} \text{物体} &: \frac{m}{m+M} v_0 \\ \text{箱} &: \frac{m}{m+M} v_0 \\ \text{エネルギー} &: \frac{mMv_0^2}{2(m+M)} \end{aligned}$$

(3)

$$\begin{aligned} T_1 &= \frac{L}{2v_0} \\ T_2 &= \frac{L}{v_0} \left(\frac{1}{2} + \frac{1}{e} \right) \\ T_3 &= \frac{L}{v_0} \left(\frac{1}{2} + \frac{1}{e} + \frac{1}{e^2} \right) \\ T_4 &= \frac{L}{v_0} \left(\frac{1}{2} + \frac{1}{e} + \frac{1}{e^2} + \frac{1}{e^3} \right) \\ V_1 &= \frac{1}{2} (1+e) v_0 \\ V_2 &= \frac{1}{2} (1-e^2) v_0 \\ V_3 &= \frac{1}{2} (1+e^3) v_0 \end{aligned}$$



2

(1)

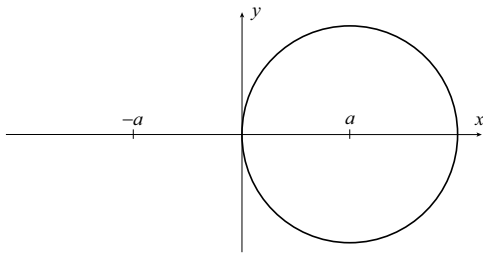
$$V(x, y) = \frac{kq}{\sqrt{(x-a)^2 + y^2}}$$

(2)

$$\text{大きさ} : \frac{kq}{(x-a)^2 + y^2}$$

$$\text{向き} : \left(\frac{x-a}{\sqrt{(x-a)^2 + y^2}}, \frac{y}{\sqrt{(x-a)^2 + y^2}} \right)$$

(3)



(4)

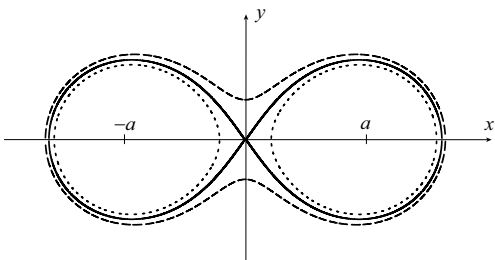
$$\text{大きさ} : \frac{2kqy}{(a^2 + y^2)^{3/2}}$$

$$\text{向き} : (0, 1)$$

(5)

$$\frac{2kq}{a}$$

(6)



(7) $m^0 \text{ kg}^1 \text{ s}^{-3} \text{ A}^{-1}$

(8) A_1, A_2, A_4

(9)

$$A_0 = \frac{2kq}{a}$$

$$A_3 = \frac{2kq}{a^3}$$

$$A_5 = -\frac{kq}{a^3}$$

(10)

$$\pm\sqrt{2}$$

(11)

$$c = \sqrt{2}a$$

(12) 違いの説明: 実線は y 軸近くで平らだが、点線は y 軸近くで原点方向にくぼんでいる

