

宇田雄一「古典物理学」

【3c3b3】 $0 \leq t - 2nt_0 \leq t_0 \Rightarrow$

$$\theta(t) - 2n\theta_0 = \cos^{-1} \left[\frac{h^2/r(t) + qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$

【3c4】 $qm(2,1) = -ab^2 m(1,1)/2$ and

$\forall t \in \mathbb{R}$; 【3c4a】and【3c4b】and【3c4c】

$$【3c4a】|t| = \frac{[m(1,1)]^2}{3[qm(2,1)]^2} \left[-\frac{qm(2,1)}{m(1,1)} r(t) + h^2 \right] \sqrt{-2 \frac{qm(2,1)}{m(1,1)} r(t) - h^2}$$

$$【3c4b】t < 0 \Rightarrow \theta(t) = -\cos^{-1} \left[\frac{h^2 m(1,1)/r(t) + qm(2,1)}{-qm(2,1)} \right]$$

$$【3c4c】t > 0 \Rightarrow \theta(t) = \cos^{-1} \left[\frac{h^2 m(1,1)/r(t) + qm(2,1)}{-qm(2,1)} \right]$$

【3c5】 $-ab^2 m(1,1)/2 < qm(2,1) < 0$ and

$\forall t \in \mathbb{R}$; 【3c5a】and【3c5b】and【3c5c】

$$【3c5a】|t| = \frac{1}{K} \sqrt{K[r(t)]^2 - 2 \frac{qm(2,1)}{m(1,1)} r(t) - h^2} \\ + \frac{qm(2,1)}{m(1,1)K\sqrt{K}} \cosh^{-1} \left[\frac{Kr(t) - qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$

$$【3c5b】t < 0 \Rightarrow \theta(t) = -\cos^{-1} \left[\frac{h^2/r(t) + qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$

$$【3c5c】t > 0 \Rightarrow \theta(t) = \cos^{-1} \left[\frac{h^2/r(t) + qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$

【3c6】 $0 < qm(2,1)$ and $\forall t \in \mathbb{R}$; 【3c6a】and【3c6b】and【3c6c】

$$【3c6a】|t| = \frac{1}{K} \sqrt{K[r(t)]^2 - 2 \frac{qm(2,1)}{m(1,1)} r(t) - h^2} \\ + \frac{qm(2,1)}{m(1,1)K\sqrt{K}} \cosh^{-1} \left[\frac{Kr(t) - qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$

$$【3c6b】t < 0 \Rightarrow \theta(t) = -\cos^{-1} \left[\frac{h^2/r(t) + qm(2,1)/m(1,1)}{\sqrt{[qm(2,1)/m(1,1)]^2 + Kh^2}} \right]$$