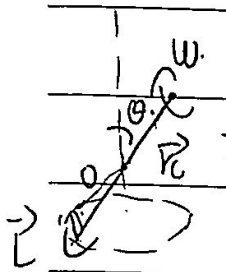
178. 4-19

(1) ↻ 顺时针.

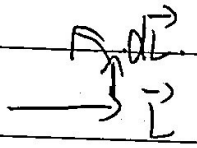


(2) $r_2 \cdot mg\sin\theta\, dt = J_c\omega \cdot \sin\theta\, d\varphi$.

$\Rightarrow \omega_p = \frac{r_2 mg}{J_c\omega}$.

178. 4-20

(1).



∴ $\vec{j}$ 方向

(2) $\int M dt = \vec{L} - \vec{L}_0 = L\vec{j} - L\vec{i}$

179. 4-21

$$\begin{cases} mg - T = ma_c \\ T - R = J\beta \\ \beta \cdot R = a_c \\ J = \frac{1}{2}mR^2 \end{cases} \Rightarrow \begin{cases} a_c = \frac{2}{3}g \text{ 方向}\downarrow \\ T = \frac{1}{3}mg \text{ 方向}\downarrow. \end{cases}$$

179. 4-22

$$\begin{cases} mgR = \frac{1}{2}mV^2 + \frac{1}{2}J\omega^2 \\ \omega \cdot r = V \end{cases} \Rightarrow V = \sqrt{\frac{10}{7}gR}$$

$F_N - mg = ma_{cn} = m\frac{V^2}{R} \Rightarrow F_N = \frac{17}{7}mg$, 方向↑

179. 4-23

$\int \vec{M} dt = \vec{L}_1 - 0$, $\int \vec{M} dt = (R-h)\int \vec{I}$ $\Rightarrow L_1 = (R-h)I$

$L_1 = J\omega_0 \Rightarrow \omega_1 = \frac{2(R-h)I}{2mR^2}$, $I = mV_0 \Rightarrow V_0 = \frac{I}{m}$ 设 F_f.

∴ $R\int F_f dt = J\omega_2 + J\omega_1$, $-\int F_f dt = mV_1 - mV_0$, $V_1 = R\omega_2$.

∴ ~~$\omega_2 = \frac{2V_0}{R} + \omega_1 = \frac{2hI}{mR^2}$~~ ~~方向⊗~~ $\omega_2 = \frac{5Ih}{7mR^2}$ 方向⊗

$\frac{4RI - 2hI}{mR^2}$

1) 9.4-24.

$mg\frac{L}{2}(1-\cos\theta) = \frac{1}{2}mv_c^2 + \frac{1}{2}J\omega^2$, $J = \frac{1}{12}mL^2$.

我解 v_B 干嘛

v_{13} 水平 $\therefore$ ~~$v_B = \omega\frac{L}{2}\sin\theta$~~. $v_{13}\cdot dt = \frac{L}{2}(\sin(\theta+d\theta)-\sin\theta)$.

$\therefore v_{13} = \frac{L}{2}\frac{\sin(\theta+d\theta)-\sin\theta}{dt} = \frac{L}{2}\frac{\sin(\theta+d\theta)-\sin\theta}{d\theta}\frac{d\theta}{dt} = \frac{L}{2}\cos\theta\cdot\omega$

$\therefore$ 因为 $v_c = \frac{L}{2}\sin\theta\cdot\omega$

$\therefore$ $\begin{cases} v_c = \sqrt{\frac{L(1-\cos\theta)g}{1+\frac{3}{3\sin^2\theta}}} \\ \omega = \end{cases}$ $\omega = \frac{2v_L}{L\sin\theta} = \frac{2}{L\sin\theta}\sqrt{\frac{L(1-\cos\theta)}{1+\frac{3}{3\sin^2\theta}}}$

$= 2\sqrt{\frac{3(1-\cos\theta)g}{L(3\sin^2\theta+3)}}$