67. 1-22

(1) $\vec{v} = \frac{dy}{dt} = 6t\,\vec{j}$ m/s $\quad \vec{a} = \frac{d\vec{v}}{dt} = 6\,\vec{j}$ m/s².

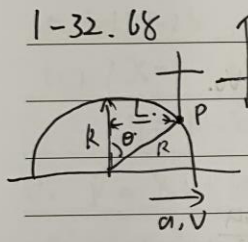
(2) $\omega = \frac{|v|}{R} = \frac{6t}{R}$ $\quad \vec{v}_p = \omega \cdot \frac{R}{2} = 3t\,\vec{j}$ m/s

$\frac{d\omega}{dt} = \frac{6}{R}$ $\quad \vec{v}_p = \omega \cdot \frac{R}{2}$, $a_t = \frac{d|\vec{v}_p|}{dt} = \frac{d\omega}{dt}\frac{R}{2} = \frac{6}{R}\cdot\frac{R}{2} = 3\ \text{m/s}^2\,\vec{j}$

$a_n = \frac{1}{\rho}v^2 = \frac{2}{R}\cdot 9t^2 = 18t^2$

$\therefore\ a = \sqrt{a_n^2 + a_t^2} = 3\sqrt{1+36t^2}$ m/s²

1-32. 68




$L = R\sin\theta = L_0 - vt$ $\quad \therefore R\cos\theta\frac{d\theta}{dt} = -v \Rightarrow \frac{d\theta}{dt} = -\frac{v}{R\cos\theta}$

$h = R\cos\theta$ $\quad \frac{dh}{dt} = -R\sin\theta\frac{d\theta}{dt} = \tan\theta\cdot v$

$\therefore\ \vec{v}_p = v\cdot\tan\theta\cdot\vec{j}$ $\quad \vec{a}_p = \frac{d\vec{v}_p}{dt} = a\tan\theta - \frac{v^2}{R\cos^3\theta}$