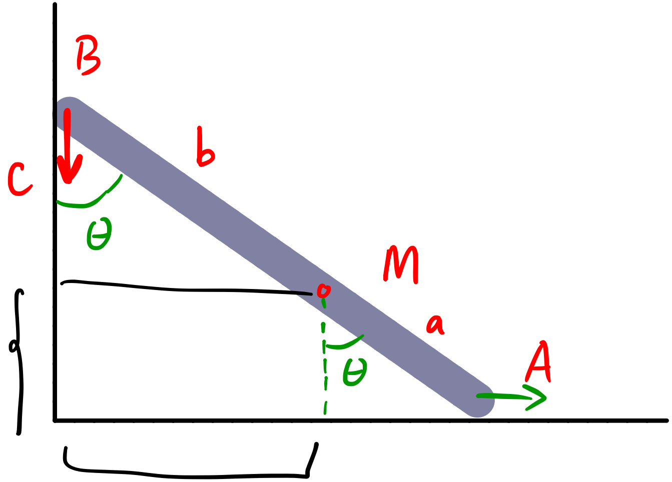


M点坐标

$$\frac{x}{b} = \sin\theta \qquad \frac{y}{a} = \cos\theta$$

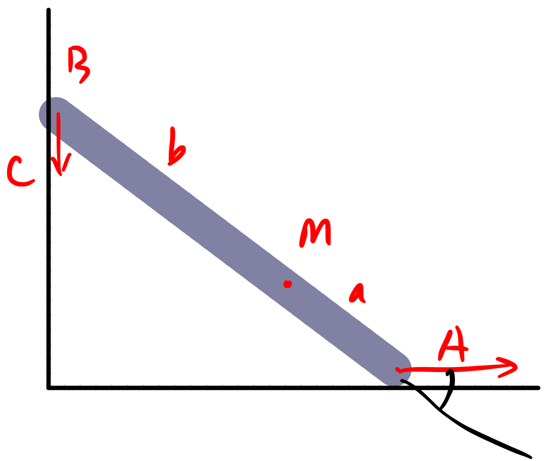
$$\theta = \theta(t)$$

$$\left(\frac{x}{b}\right)^2 + \left(\frac{y}{a}\right)^2 = 1$$ 轨道方程.

$$v_x = \frac{dx}{dt} = b \cdot \cos\theta \cdot \dot{\theta} \qquad v_y = \frac{dy}{dt} = -a \cdot \sin\theta \cdot \dot{\theta}$$

$$\theta = \arccos \frac{(a+b)\cos\theta - ct}{a+b} \qquad \dot{\theta} = \cdots$$

$$a_x = \frac{dv_x}{dt} = \qquad a_y = \frac{dv_y}{dt} =$$



$\vec{V}_B$ 投影到沿AB方向

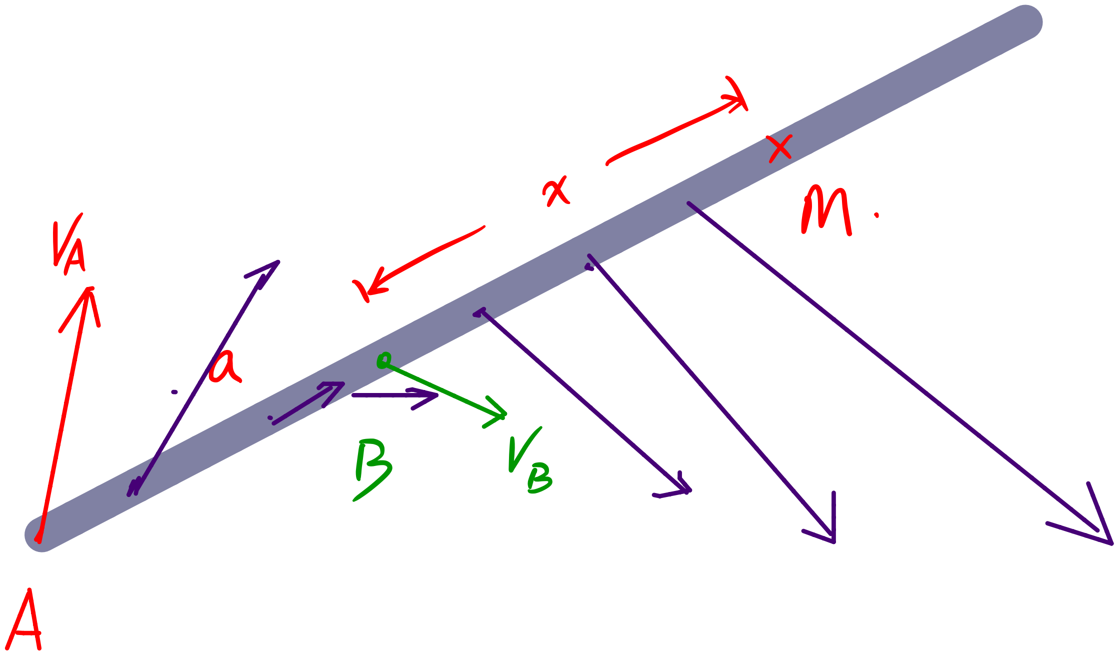
等于 $\vec{V}_A$ 投影到AB方向.

$V_B = c$, $\quad c\cos\theta = V_A\cdot\sin\theta$

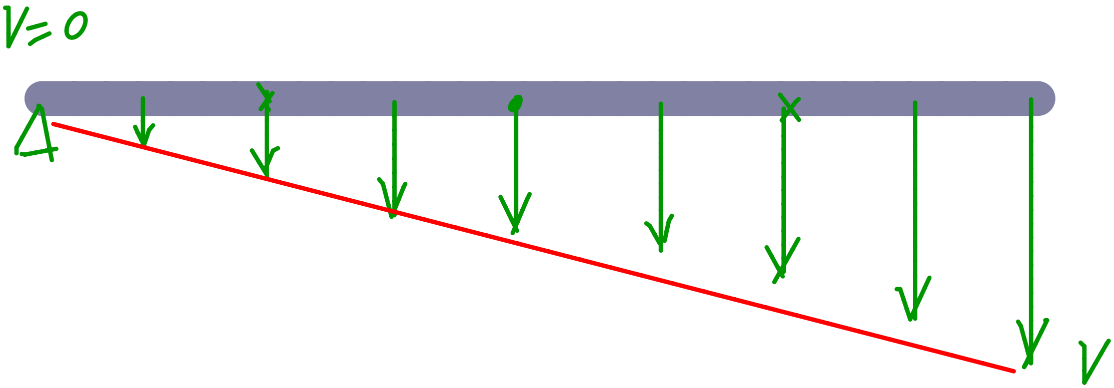
$V_A = c\cdot \mathrm{ctan}\,\theta$

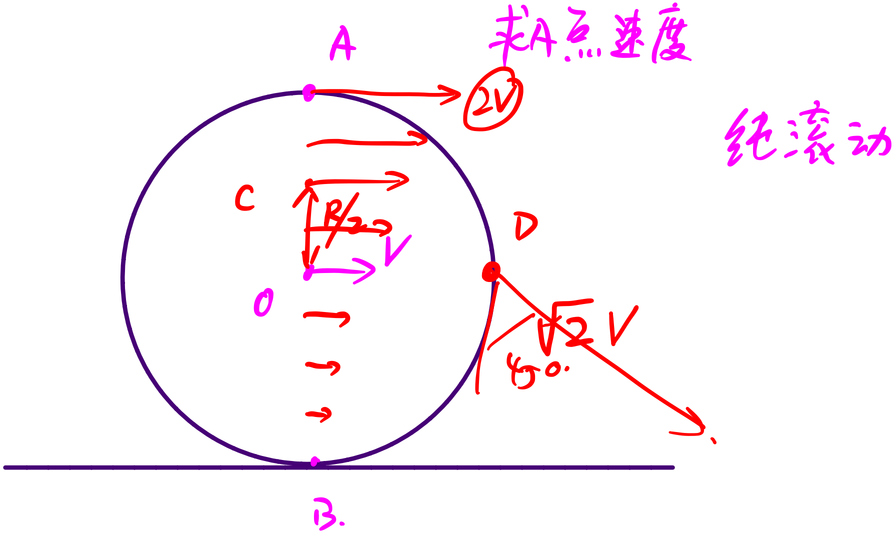
M点 y方向速度. $c\,\dfrac{a}{a+b}$

x方向速度 $V_A\cdot\dfrac{b}{a+b} = c\cdot\mathrm{ctan}\,\theta\cdot\dfrac{b}{a+b}$



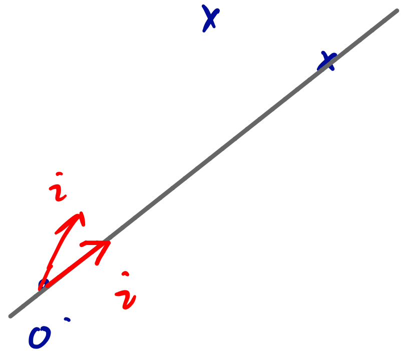
v_A
a
x
m
B
v_B
A


V=0
V



求A点速度
纯滚动
A
2V
C
R/2
V
O
D
√2 V
45°
B.

随动

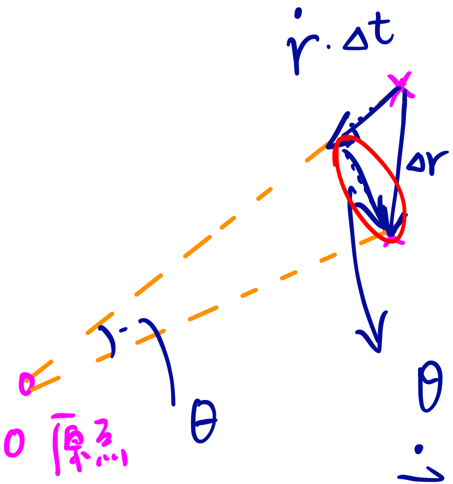


$\vec{r} = f(r, \vec{i})$

$\vec{r} = r\,\vec{i}$

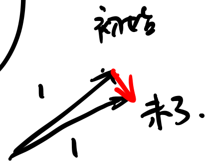
$\vec{V} = \dot{r}\,\vec{i} + r\,\dot{\vec{i}}$

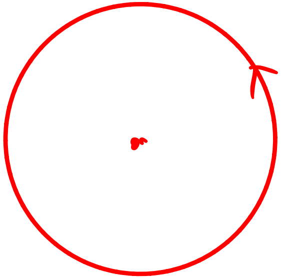
微分　　微分



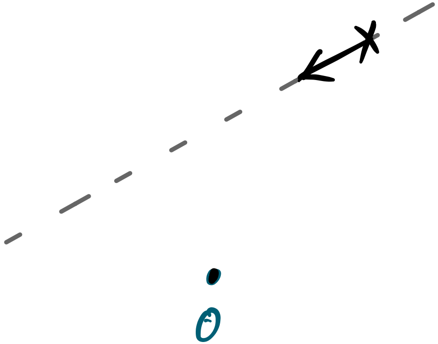
$\dot{\vec{i}}$

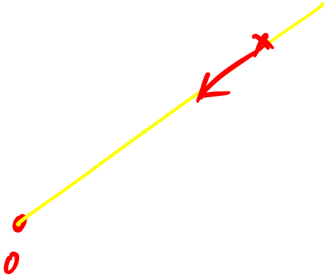
$\dot{\vec{i}} = \dot{\theta}$



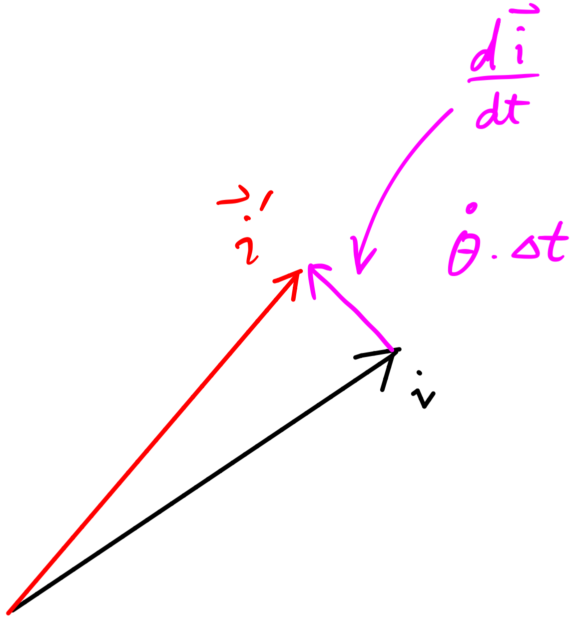


$V = r \cdot \dot{\vec{i}}$

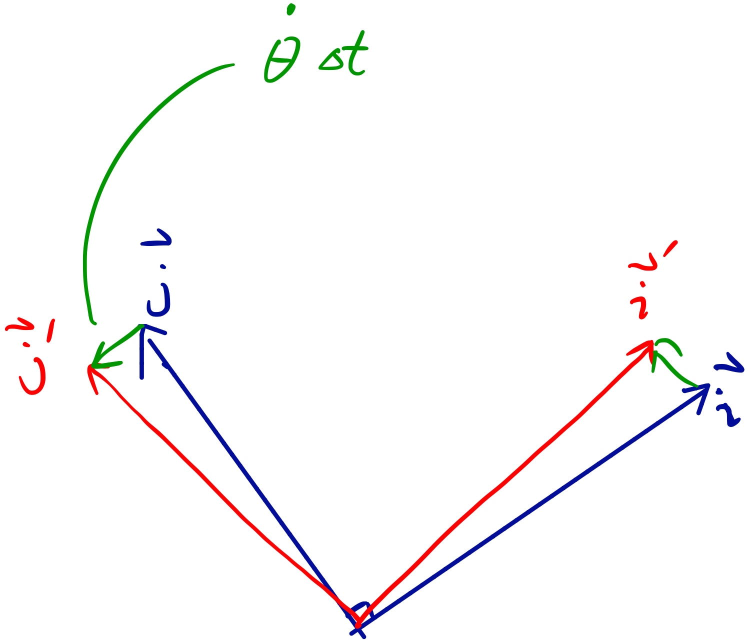




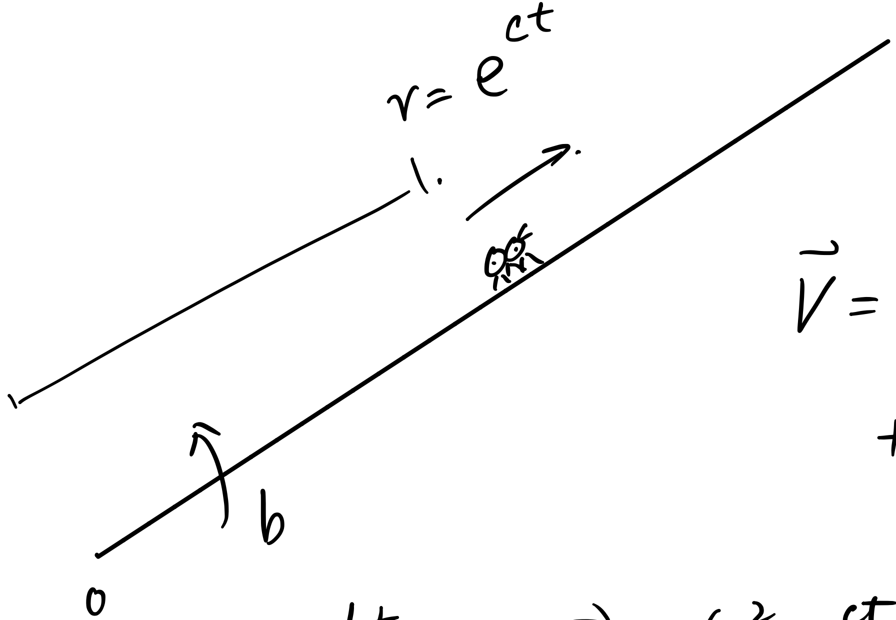
$V = \dot{r} \cdot \vec{i}$



$\dot{\theta}$



$$\frac{d\vec{j}'}{dt} = -\dot{\theta}\,\vec{i}'$$



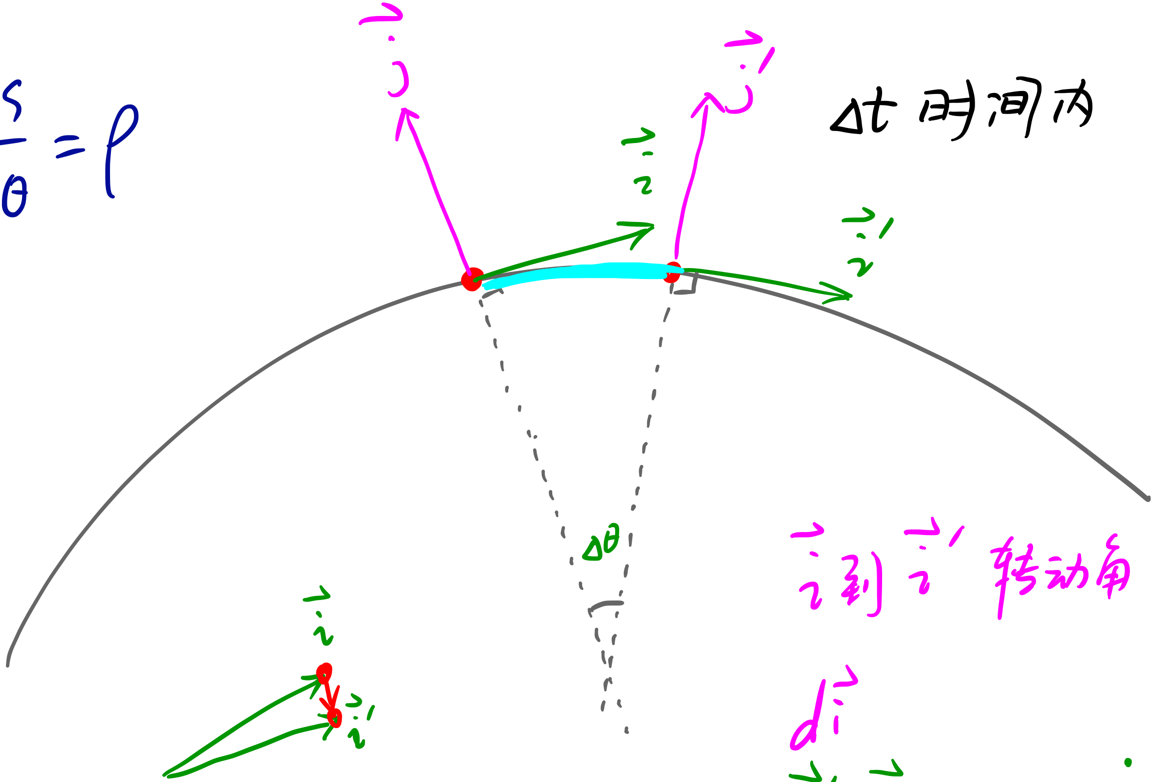
$$\theta = bt$$

$$\vec{V} = c \cdot e^{ct} \cdot \vec{i} + e^{ct} \cdot b \cdot \vec{j}$$

$$\vec{a} = (c^2 \cdot e^{ct} - c \cdot e^{ct} \cdot b^2)\,\vec{i}$$

$$2 \cdot c \cdot e^{ct} \cdot b \cdot \vec{j}$$

$$\frac{ds}{d\theta} = \rho$$



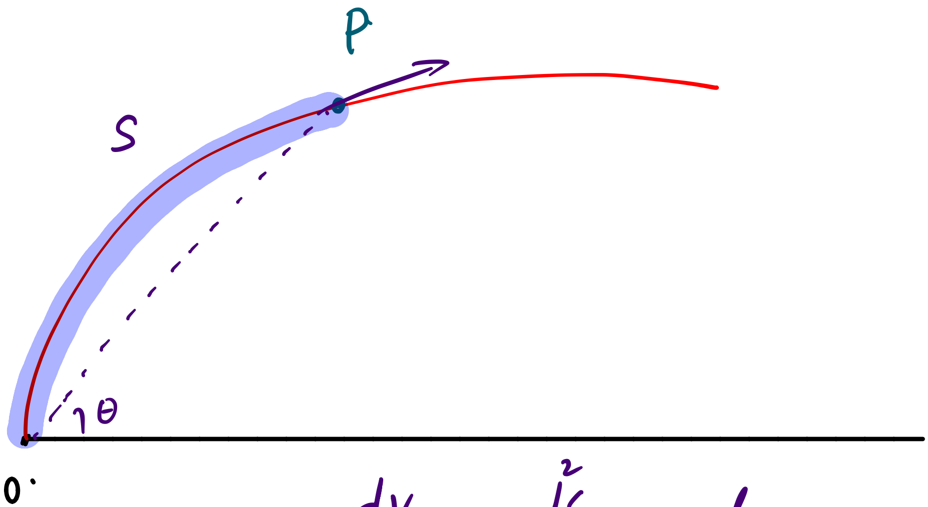
Δt 时间内

$\vec{i}$ 到 $\vec{i}'$ 转动角 $-\theta$

$d\vec{i}$

$$\frac{d\vec{i}}{d\theta} \quad \lim_{\Delta\theta \to 0} \frac{\vec{i}' - \vec{i}}{\Delta\theta} = \frac{\dot{\jmath} \cdot \Delta\theta}{\Delta\theta}$$

$$\frac{di}{d\theta} = j$$



$\dot{\theta} =$ 常数

$S = 4a\sin\theta_{(t)}$

$$a_t = \frac{dv}{dt} = \frac{d^2s}{dt^2} = \frac{d}{dt}(4a\cdot\cos\theta\cdot\dot{\theta})$$

$$= -4a\cdot\sin\theta\cdot(\dot{\theta})^2 + \underbrace{4a\cdot\cos\theta\cdot\ddot{\theta}}$$

$\dot{\theta} = \text{const}$

所以 $\ddot{\theta} = 0$

$$a_n = \frac{v^2}{\rho} = \frac{(4a\cos\theta\cdot\dot{\theta})^2}{4a\cos\theta}$$

$\frac{ds}{d\theta}$

$$= 4a\cos\theta\cdot(\dot{\theta})^2$$

$$a = \sqrt{a_t^2 + a_n^2} = 4a(\dot{\theta})^2 = 常数.$$

$$v_x = \frac{dx}{dt} \qquad v_y = \frac{dy}{dt} \qquad v_z = \frac{dz}{dt}.$$

$$v = \sqrt{v_x^2 + v_y^2 + v_z^2}$$

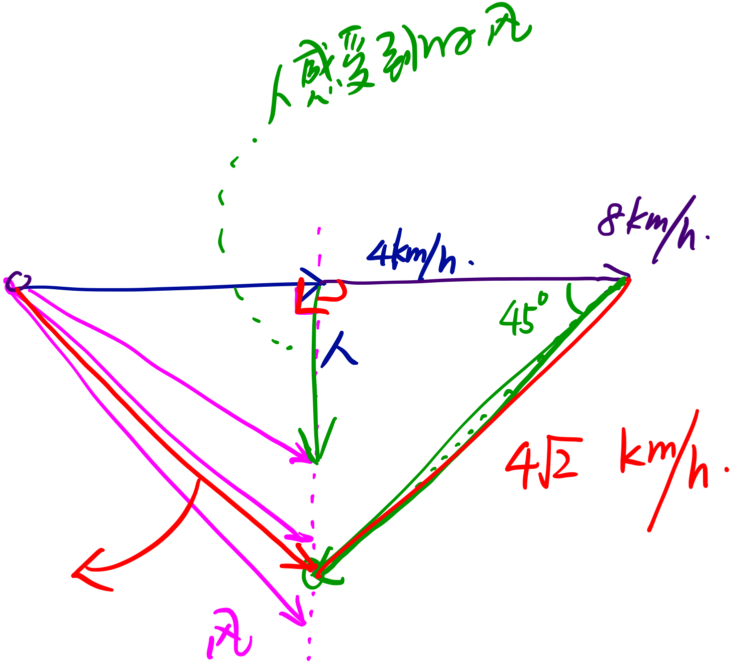
$$= \sqrt{64 + 16}$$

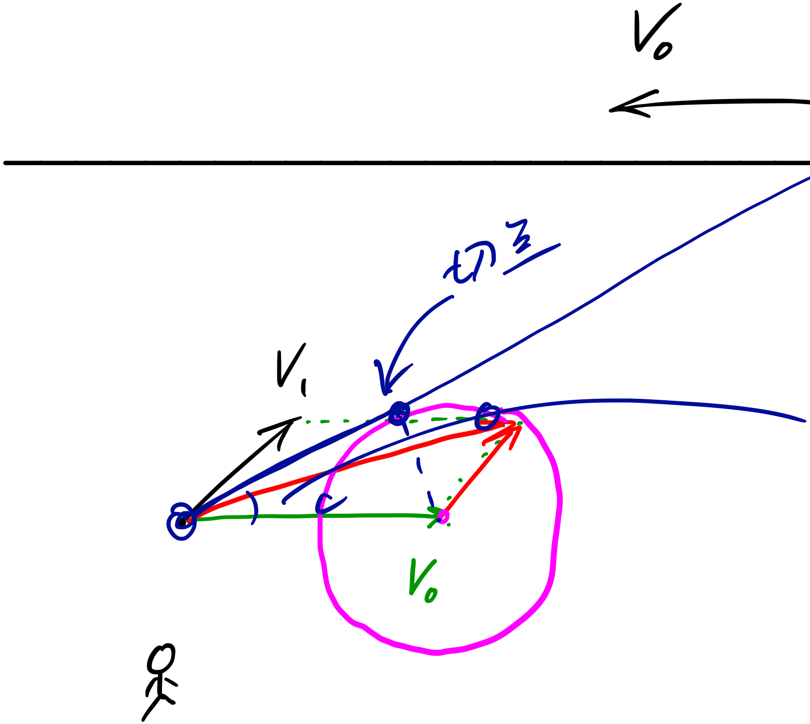
$$a_x = \frac{d^2x}{dt^2} \qquad a_y = \frac{d^2y}{dt} \qquad a_z = \frac{d^2z}{dt^2}$$

$$a = \sqrt{a_x^2 + a_y^2 + a_z^2} = 32$$

$$\frac{v^2}{\rho} = a.$$

$$\rho = \frac{v^2}{a} = \frac{80}{32} = 2.5$$


人感受到的风
4km/h.
8km/h.
45°
人
$4\sqrt{2}$ km/h.
风

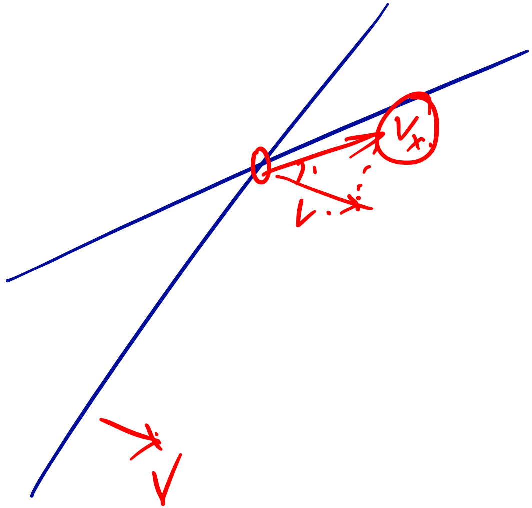


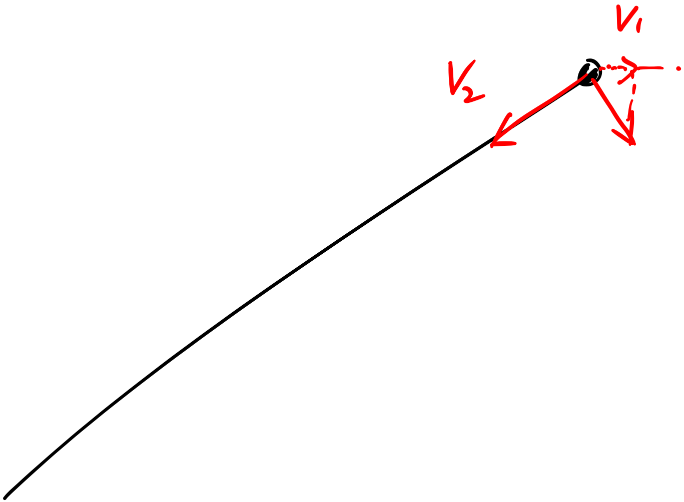
$$\theta = \arcsin \frac{V_1}{V_0}$$

$$\frac{dr}{dt} = -V_2$$

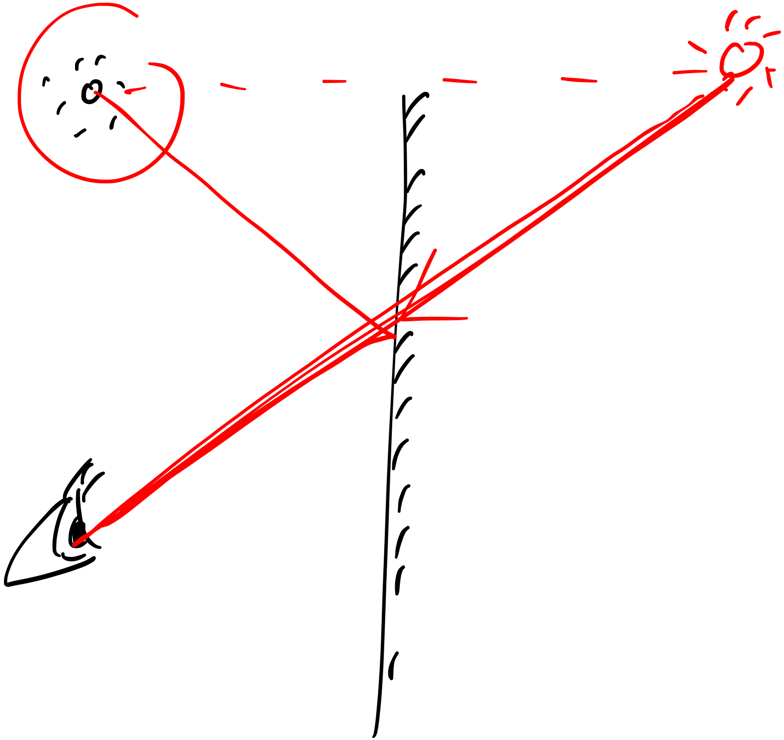
$$V_{\text{船}} = V_1 \cdot \sin\varphi$$

$$V_1 = V_{\text{船}} \cdot \sin\varphi$$

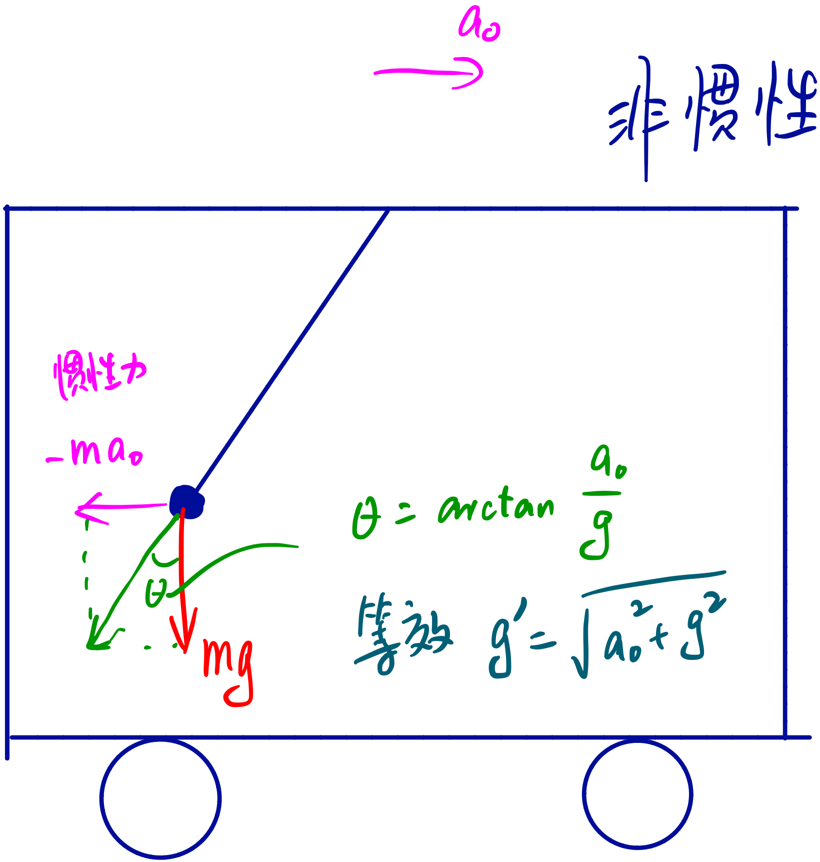




$$\begin{cases} \dfrac{dr}{dt} = -V_2 \\[2ex] \dfrac{d\varphi}{dt} \cdot r = V_1 \cdot \sin\varphi \end{cases}$$

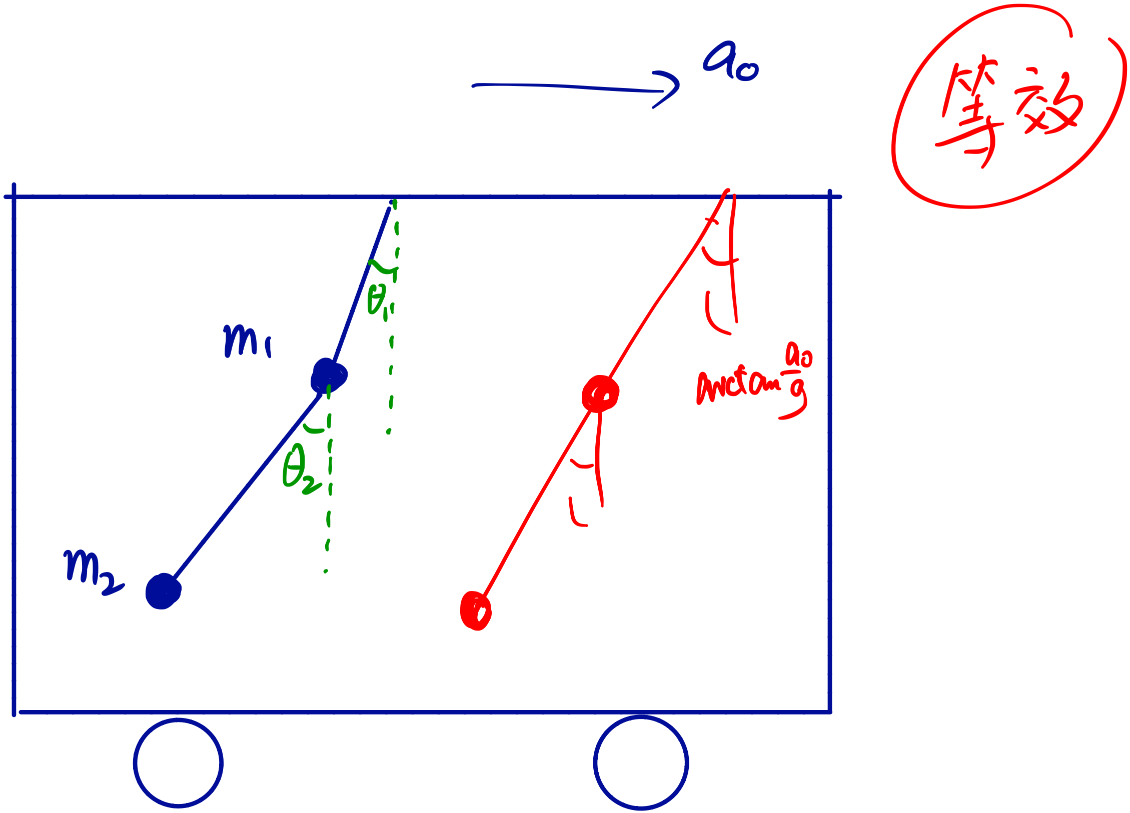


非惯性参考系



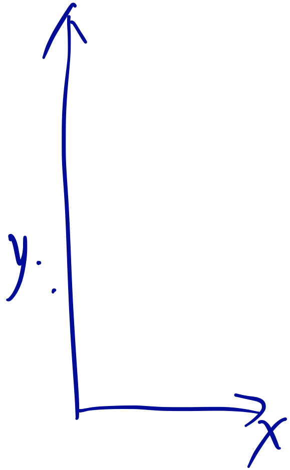
$$\theta = \arctan \frac{a_0}{g}$$

等效 $g' = \sqrt{a_0^2 + g^2}$



a_0
等效
m_1
m_2
θ_1
θ_2
$\arctan\frac{a_0}{g}$

重力势 $V = mgy.$



$$F_x = -\frac{\partial V}{\partial x} = 0$$

$$F_y = -\frac{\partial V}{\partial y} = -mg$$

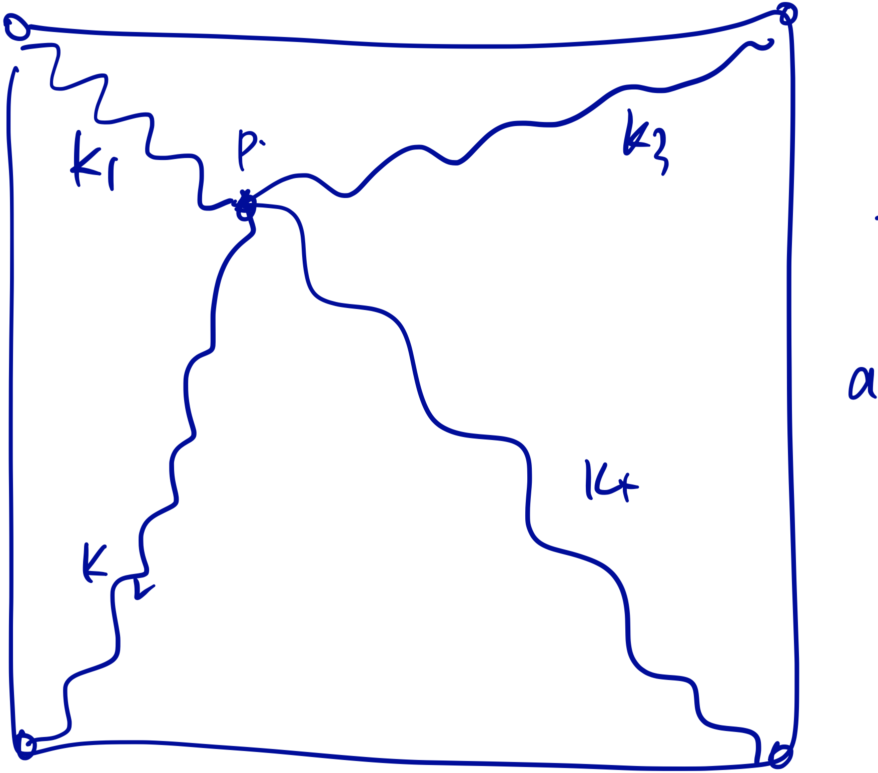
$\cdot\, q$

$Q\ \bullet$

$$V = -k\frac{Qq}{r} \qquad r = \sqrt{x^2+y^2+z^2}$$

$$F_x = -\frac{\partial V}{\partial x} = -kQq\,\frac{x}{r^3}$$

$$= -kqQ \cdot \frac{\theta(x/r)}{r^2}$$



弹簧原长0.

求P点坐标.