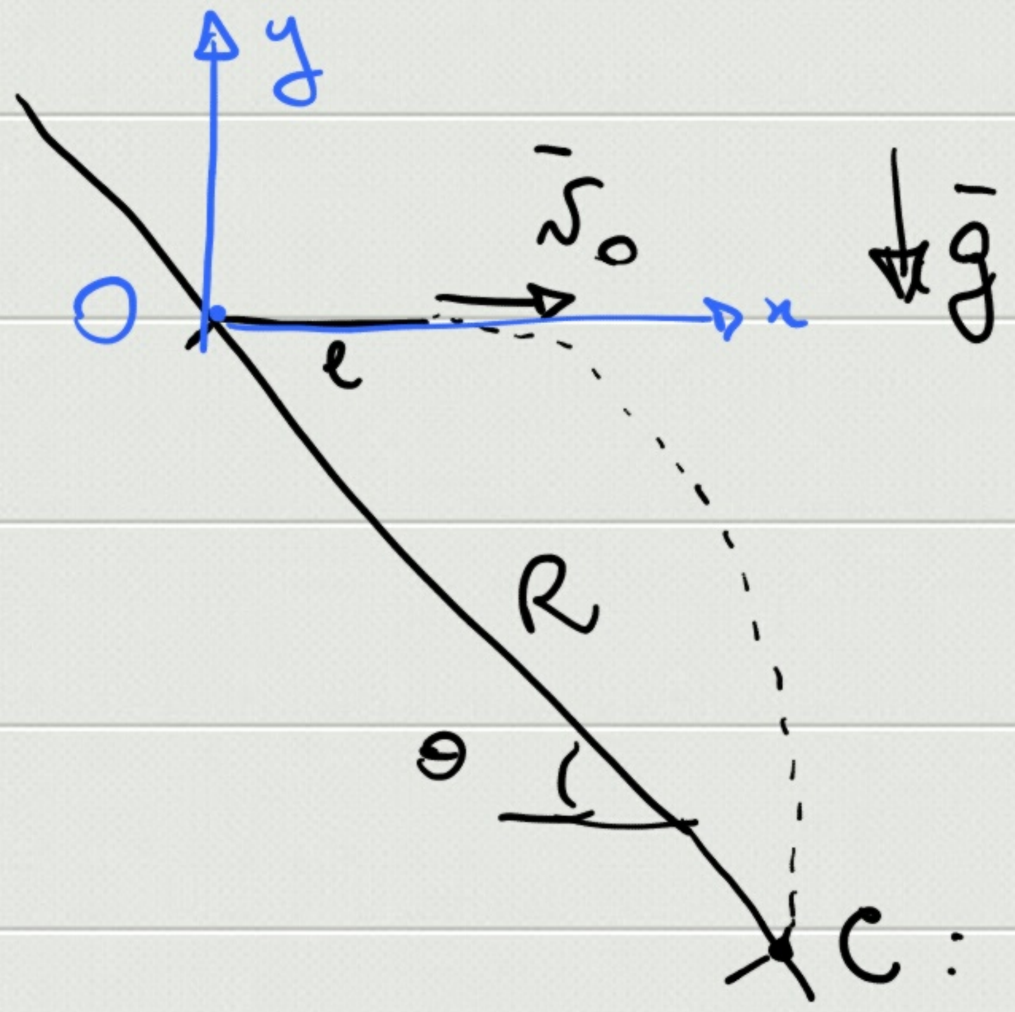


$\theta = \pi/4$

$l = 5\,m$

$v_0 = 30\,m/s$

- $\bar{r}(t) = \bar{r}_0 + \bar{v}_0 t + \frac{1}{2}\bar{a}t^2$

- $\bar{r}(t) = \bar{r}_0 + \bar{v}_0 t + \frac{1}{2}\bar{a}t^2 + \dots$ *

- $\bar{r}(t) = \frac{1}{2}\bar{a}t^2$

- $\bar{r}(t) = \bar{v}_0 + \frac{1}{2}\bar{a}t^2 + \dots$

$$\begin{cases} x(t) = l + v_0 t \\ y(t) = -\frac{1}{2}gt^2 \end{cases} \qquad \begin{cases} x_c = x(t_c) \\ y_c = y(t_c) \end{cases}$$

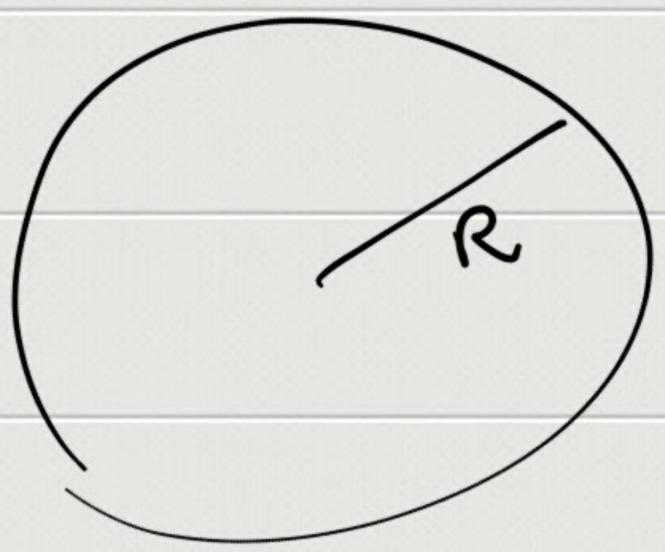
$$x_c = -y_c$$

$$l + v_0 t_c = \frac{1}{2}g t_c^2 \Rightarrow t_c^2 - \frac{2v_0}{g}t_c - \frac{2l}{g} = 0$$

$$t_c = \frac{v_0}{g} \pm \sqrt{\left(\frac{v_0}{g}\right)^2 + \frac{2l}{g}} = 6.2\,s$$

$$x_c = -y_c = 193.4 \text{ m}$$

$$R = x_c\sqrt{2} = 273.5 \text{ m}$$



$R = 150\ m$

$T = 60\ s$

$v_0 = 0 \qquad a_T = cost$

$v_m,\ a_T,\ a(t)$

$$v_m = \frac{\Delta s}{\Delta t} = \frac{2\pi R}{T} = 15.7\ m/s$$

$$- \cancel{v_m^2 = 2a \cdot 2\pi R}$$

$$- \cancel{v_m = a_T T}$$

$$- \ 2\pi R = \frac{1}{2} a_T T^2 \quad \Rightarrow \quad a_T = \frac{4\pi R}{T^2} = 0.52\ m/s^2$$

$$- \ \cancel{a_T = \frac{v_m^2}{R}}$$

$$a = \sqrt{a_T^2 + a_N^2} \qquad a_N = \frac{v^2}{R} \qquad v(t) = a_T t$$

$$\Rightarrow \ a = \sqrt{a_T^2 + \left(\frac{a_T^2 t^2}{R}\right)^2} = \boxed{a_T \sqrt{1 + \frac{a_T^2 t^4}{R^2}} = a(t)}$$