$$\dot{x} = f(x) \Rightarrow \begin{cases} \dot{x}_1 = x_1^2 + \dfrac{1+x_1}{\cos x_1} x_2 \\ \dot{x}_2 = -x_2^2 + u \end{cases}$$

reference to be tracked :

$$x_1 \rightarrow x_{1,ref} = \sin 2t$$

$\Downarrow$

$$e = x_1 - x_{1,ref}$$

$$\dot{e}_1 = x_1^2 + \underbrace{\frac{1+x_1}{\cos x_1}}_{①} x_2 - \underbrace{2\cos 2t}_{(x_{1,ref})'}$$

$$V_1 = \frac{1}{2} e_1^2$$

$$\dot{V}_1 = e_1 (-k_1 e_1 + k_1 e_1 + x_1^2 + \frac{1+x}{\cos x_1} x_2 - 2\cos 2t) \quad k_1 > 0$$

$$= -k_1 e_1^2 + \left(\frac{1+x_1}{\cos x_1} x_2 + k_1 e_1 + x_1^2 - 2\cos 2t\right) e_1$$

$$= -k_1 e_1^2 + \underbrace{\left(x_2 + \frac{\cos x_1}{1+x_1}(k_1 e_1 + x_1^2 - 2\cos 2t)\right)}_{z_2 = x_2 - x_{2,r}} e_1 \frac{1+x_1}{\cos x_1}$$

$$V_2 = V_1 + \frac{1}{2}(x_2 - x_{2,r})^2$$

$$\dot{V}_2 = -k_1 e_1^2 + (x_2 + \underbrace{\frac{\cos x_1}{1+x_1}}_{②}(k_1 e_1 + x_1^2 - 2\cos 2t))\,(e_1 \frac{1+x_1}{\cos x_1} \underbrace{- x_2^2 + u}_{\dot{x}_2}$$

$$+ \underbrace{\frac{d}{dt}\left(\frac{\cos x_1}{1+x_1}(k_1 e_1 + x_1^2 - \cos 2t)\right)}_{-\dot{x}_{2,r}}$$

$k_2 > 0$

$$u = -e_1 \frac{1+x_1}{\cos x_1} + x_1^2 - \frac{d}{dt}\left(\frac{\cos x_1}{1+x_1}(k_1 e_1 + x_1^2 - \cos 2t)\right) - k_2 \left(x_2 + \frac{\cos x_1}{1+x_1}(k_1 e_1 + x_1^2 - 2\cos 2t)\right)$$

In this way,

$$\dot{V}_2 = -k_1 e_1^2 - k_2 z_2^2 < 0 \qquad x_1 \in \left(-1, \frac{\pi}{2}\right)$$

$$\bar{S} = \begin{cases} \dot{e}_1 = \cdots\cdots \\ \dot{z}_2 = \cdots\cdots \end{cases} \quad \text{is L.E.S. to} \quad \begin{pmatrix} e_1 \\ z_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$