$\alpha^2+\gamma^2=1$

$$\Rightarrow \begin{cases} \alpha = \sin\theta(s) \\ \gamma = \cos\theta(s) \end{cases}$$

このとき $\boxed{}$ が成り立つならば、

$(9) \Longleftrightarrow (\theta' - k)\cos\theta = 0$

$(10) \Longleftrightarrow (\theta' - k)\sin\theta = 0$

$\Rightarrow k = \theta'$

$$\nabla_{\frac{\partial}{\partial u^i}} \frac{\partial}{\partial u^j} = \Gamma_{ij}^k \frac{\partial}{\partial u^k} \Rightarrow \nabla_{\frac{d}{ds}} \frac{d}{ds} = \underset{0}{\Gamma_{11}^1} \frac{d}{ds}$$

$$\Gamma_{ij}^k = \sum g^{k\alpha}\left(\frac{\partial g}{\partial u} + \frac{\partial g}{\partial u} - \frac{\partial g}{\partial u}\right)$$

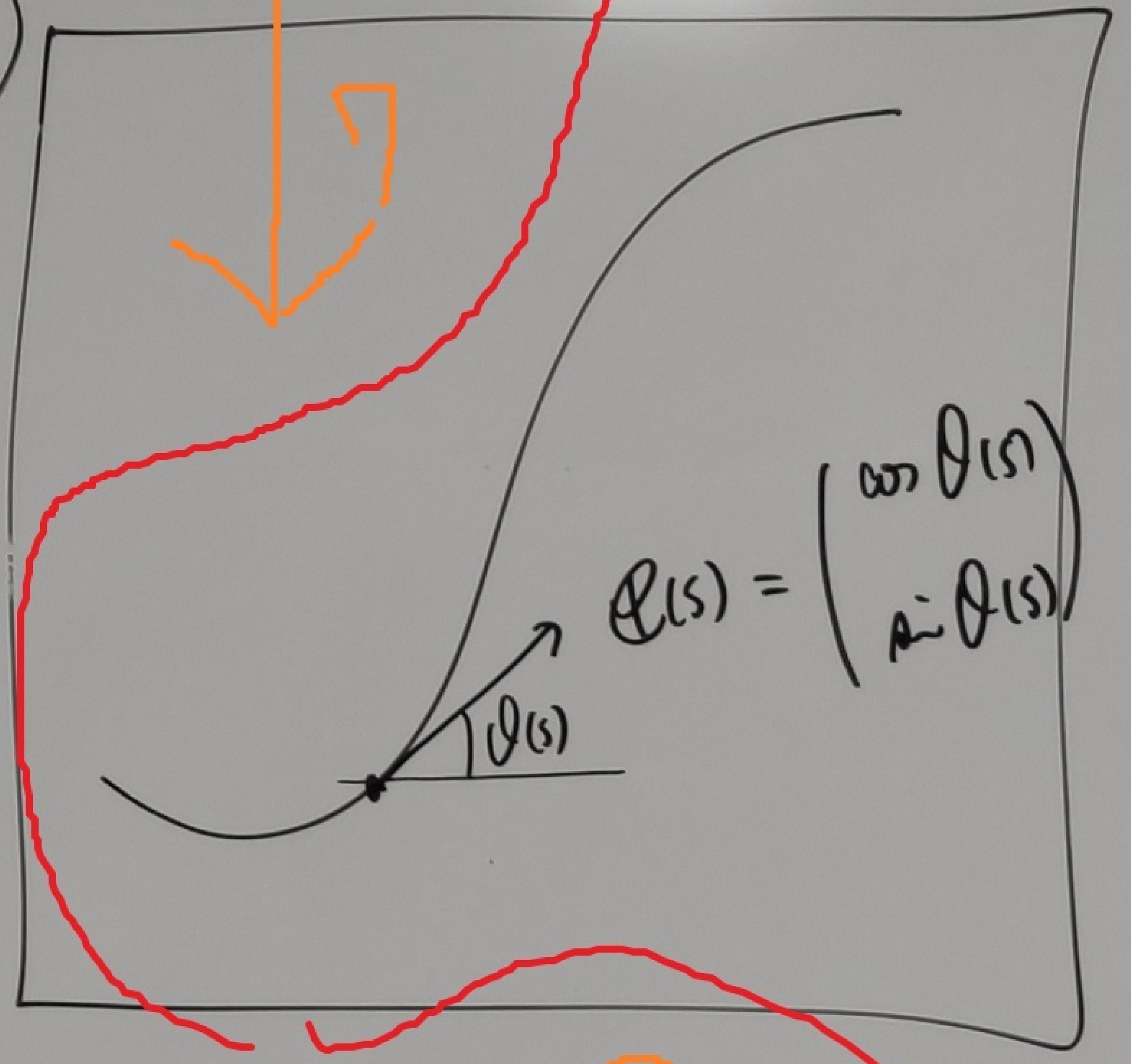
$g_{11} = g\left(\frac{d}{ds}, \frac{d}{ds}\right) = 1.$

$\boxed{g = g_{11}\, ds^2 = ds^2}$

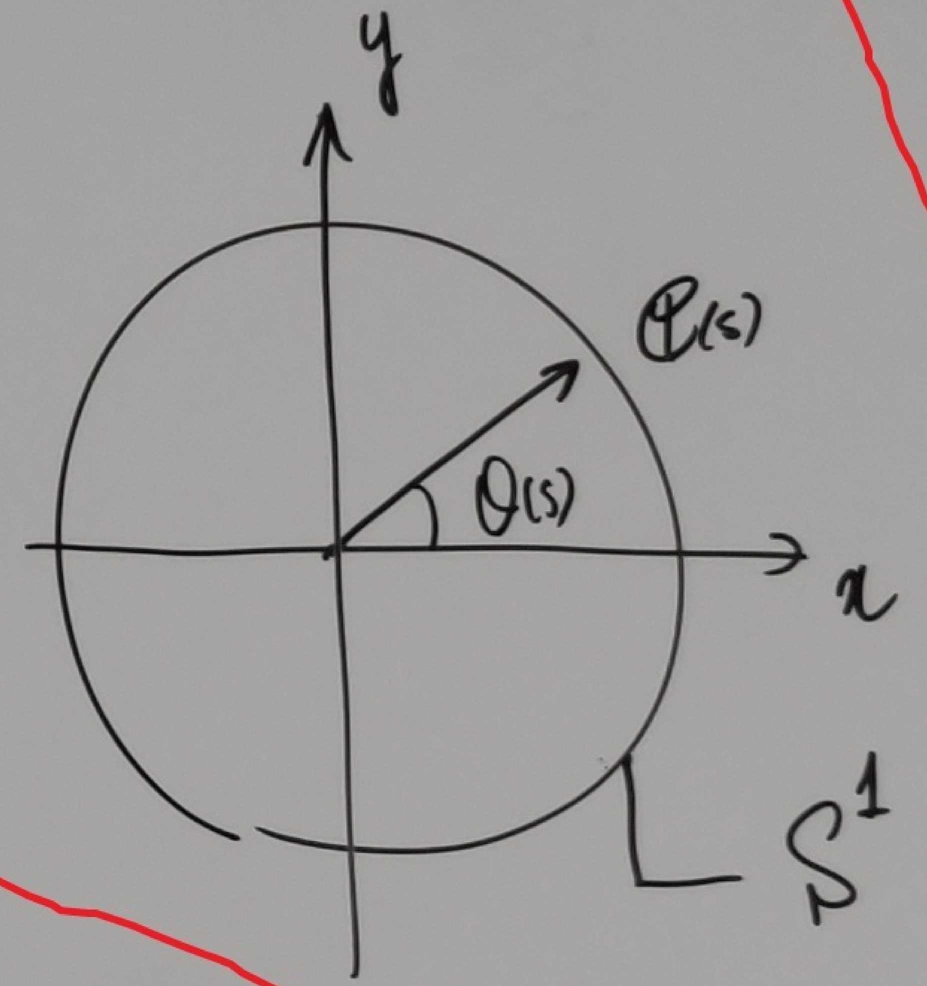
確めてほしいこと
曲線 $\gamma : I \longrightarrow S^2 \times \mathbb{R}$ のときも
(9) (10) が成立つか?

$S : T_pV \to T_pV$

$n' = \bigcirc\,\Gamma(s) - k(s)\,e(s)$



$\gamma(s)$ in $\mathbb{R}^2$



4

7

1

2

(9) $\quad \underline{\nabla_X T = \nu\, S(X)}$

$\updownarrow\ X = \frac{d}{ds}$

$$\nabla_{\frac{d}{ds}}\left(\alpha(s)\frac{d}{ds}\right) = \nu(s)\,k(s)\,\frac{d}{ds}$$

$$\alpha'\frac{d}{ds} + \alpha\,\underbrace{\left[\nabla_{\frac{d}{ds}}\frac{d}{ds}\right]}_{0} = \nu k \frac{d}{ds}$$

6

$X = \frac{d}{ds}$ $\quad T = \alpha\frac{d}{ds}.$ $\quad \left(\hat{T} = \alpha(s)\,e(s)\right)$

$\qquad \| $

$\gamma' = d\gamma\left(\frac{d}{ds}\right)$

3

$$S(X) = d\gamma^{-1}\left[-dn(X)\right]^{\tan}$$

$$= d\gamma\left(\underset{T}{\boxed{\alpha\frac{d}{ds}}}\right)$$

$$S\left(\frac{d}{ds}\right) = d\gamma^{-1}\left[-\underbrace{dn\left(\frac{d}{ds}\right)}_{n'(s)}\right]^{\tan}$$

$$= d\gamma^{-1}\left[-\bigcirc\,\Gamma(s) + \underbrace{k\,e(s)}_{=\,k\gamma'(s)}\right]^{\tan} = d\gamma^{-1}\left(k\, d\gamma\left(\frac{d}{ds}\right)\right)$$

$$= k\frac{d}{ds}.$$

5

$k = \theta'$

$\therefore\ (9) \Longleftrightarrow \alpha'(s) = k\,\gamma$

$\Longleftrightarrow \theta'\cos\theta = k\cos\theta.$

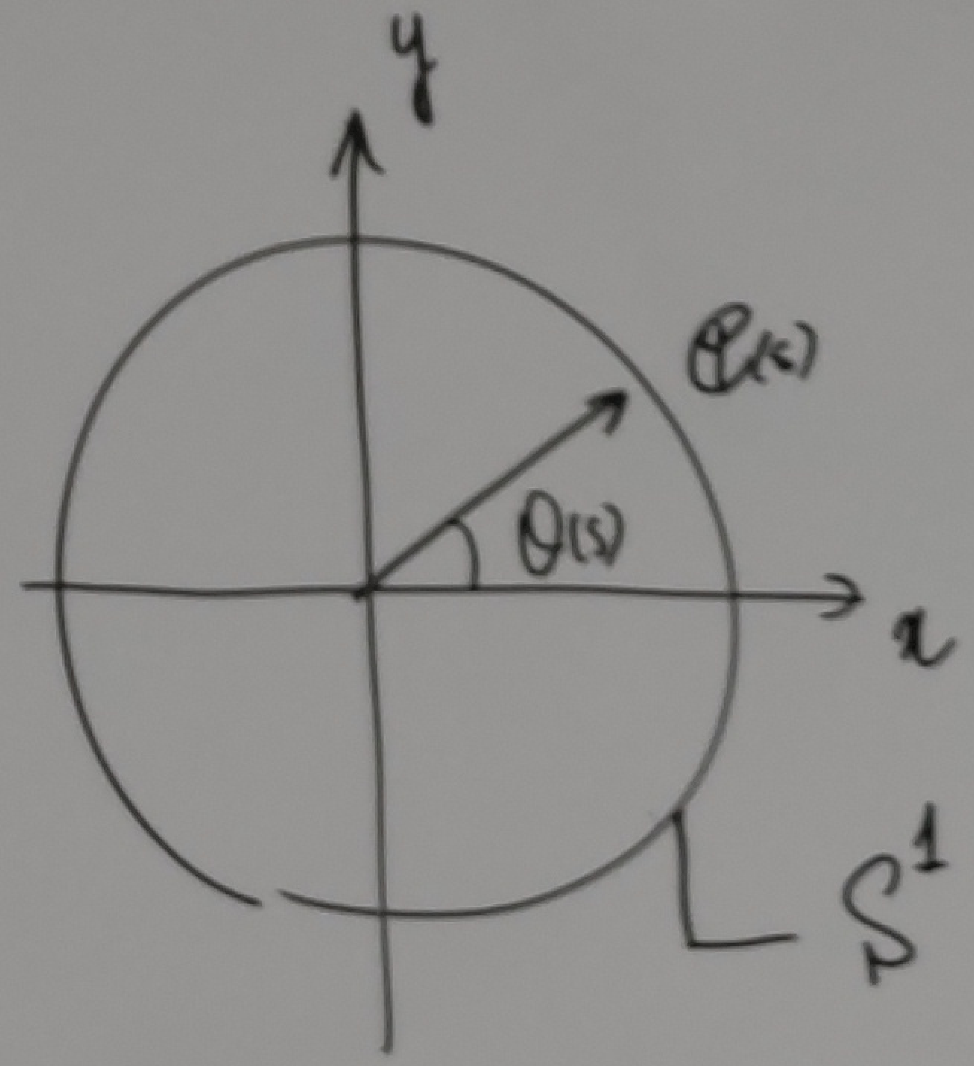
$\Longleftrightarrow (k - \theta')\cos\theta = 0$

8

零

$\gamma(s)$ in $\mathbb{R}^2$

$e(s) = \begin{pmatrix} \cos\theta(s) \\ \sin\theta(s) \end{pmatrix}$



$\kappa = \theta'$

$\therefore$ (q) $\Longleftrightarrow \alpha'(s) = \kappa\nu$

$\Longleftrightarrow \theta'\cos\theta = \kappa\cos\theta.$

$\Longleftrightarrow (\kappa - \theta')\cos\theta = 0$

$\gamma(\partial/\partial s)\|$

κを与えたとき、θ(s)は

$$\theta(s) = \int_{s_0}^{s} \kappa(u)\,du + \theta_0$$

$$\nu = \left\langle n, \frac{\partial}{\partial t} \right\rangle$$

nと$\frac{\partial}{\partial t}$のなす角$\theta$は

$$\cos\theta = \frac{\langle n, \partial/\partial t\rangle}{\|n\|\,\|\partial/\partial t\|} = \langle n, \partial/\partial t\rangle = \nu$$

で定まる。