§ Surface of revolution

R^3 中的旋轉面，$X(r,\theta)=(r\cos\theta, r\sin\theta, f(r))$

$ds^2=(1+(f'(r)^2)dr^2+r^2d\theta^2$

$$\left(\Gamma^r_{jk}\right)=\begin{pmatrix}\frac{f'f''}{1+f'^2} & 0\\ 0 & \frac{-r}{1+f'^2}\end{pmatrix}，\left(\Gamma^\theta_{jk}\right)=\begin{pmatrix}0 & \frac{1}{r}\\ \frac{1}{r} & 0\end{pmatrix}$$

Surface of revolution in R^3 is the trivial case of intrinsic rotational surface。

$g=\rho(u)^2(du^2+dv^2)$

A non-degenerate surface of R^3_1 is said to be an intrinsic rotational surface if

$$I=\rho(u)^2\begin{pmatrix}\delta & 0\\ 0 & \varepsilon\end{pmatrix}, \delta,\varepsilon\in\{-1,1\}$$

[geodesic]

1. The catenoid is the only minimal surface of revolution。
2. Helicoid
3. Pseudosphere
4. Enneper surface
5. Intrinsic rotational surface by Seher Kaya and Rafael Lopez
6. [Introduction to Lorentz Geometry Ch 1] Wellcome to Lorentz-Minkowski space by Ivo Terek Couto and Alexandre Lymberopoulos

R^n_v 稱為 a pseudo-Euclidean space of index v

$<.,.>_v: R^n\times R^n\to R$ with

$<x,y>_v:=x_1y_1+x_2y_2+...+x_{n-v}y_{n-v}-x_{n-v+1}y_{n-v+1}-...-x_ny_n$

Then Causal character 因果特點：

(1) Spacelike vector if $<v,v>_v>0$ or v=0

(2) Timelike vector if $<v,v>_v<0$

(3) Lightlike vector if $<v,v>_v=0$

$L^n:=R^n_1$ 稱為 Lorentz-Minkowski space

L^4 ：the model of a spacetime free of gravity。