

7.9 | we showed already that at each point normal coordinates with

$$g_{ab}(P) = \eta_{ab}$$

$$\Gamma^a_{bc}(P) = 0 \quad \left(\text{or } \frac{\partial^2 x^a}{\partial x^b \partial x^c} \Big|_P = 0 \right)$$

exist.

$g'_{ab} = \eta_{ab}$	conditi	number	
	10	16	(3 metrics + 3 boost left)

$$\partial g'_{ab} / \partial x'^c = 0$$

$$\partial^2 g'_{ab} / \partial x'^c \partial x'^d = 0$$

find a) $(\partial_c g_{ab}) = \overset{\text{symmetric } 4 \times 4}{10 \times 4} \text{ components}$

$\frac{\partial^2 x^a}{\partial x'^b \partial x'^c} = 4 \times 10 \text{ components}$

} identical

b. $\frac{\partial^2 g'_{ab}}{\partial x'^c \partial x'^d}$

symmetric in (ab) and (cd)

$10 \times 10 = 100 \text{ components}$

$$\frac{\partial^3 x^a}{\partial x'^b \partial x'^c \partial x'^d}$$

$4 \times (\# \text{ symmetric combink of 3 indices})$

~~0000, 0001, 0002, 0003~~ $\rightarrow$

000, 001, 002, 003

011, 012, 013

022, 023

033

4

$10 + 6 + 3 + 1 = 20$

$\vdots + \vdots$

$+ \dots$

$4 \times 20 = 80$

$\Rightarrow$ left 20 coefficients that can't be made to vanish (= # of components $\tilde{\Gamma}^a_{bcd}$)