So: $\nabla_a \nabla_b \xi_c = -\nabla_b \nabla_c \xi_a - \nabla_c \nabla_a \xi_b$

$$= -\nabla_b \nabla_c \xi_a + \nabla_c \nabla_b \xi_a = -R_{bca}{}^{d}\xi_d$$

→ $\boxed{\nabla_a \nabla_b \xi_c = -R_{bca}{}^{d}\xi_d}$, 2^{nd} derivatives of ξ_μ are defined by

$\xi_\mu\big|_p$ and $\nabla\xi\big|_p$, for a particular p.

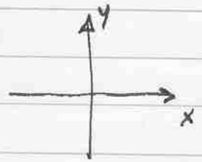
- So can only choose freely $\boxed{\xi_a}$ and $\boxed{\nabla_a \xi_b}$ at a given point.

  then ξ_a is determined everywhere else. ⟶ there's almost no solns.

How much freedom? $4 + 6 = 10$ (locally)

But if try to ~~[illegible]~~ integrate for a general spacetime, likely will find no soln.

ex:



$$\partial_i \xi_j + \partial_j \xi_i = 0$$

rotation

$\partial_x \xi_x = 0 \longrightarrow \xi_x = f(y) = -cy + d$ translations

$\partial_y \xi_y = 0 \longrightarrow \xi_y = g(x) = cx + e$

$\partial_x \xi_y + \partial_y \xi_x = 0 \longrightarrow \dfrac{dg}{dx} = -\dfrac{df}{dy} = c$