APPENDIX 11:

A SIMPLE PROOF OF THE EVANS LEMMA.

The Evans Lemma is the direct result of the tetrad postulate of differential geometry:

$$\boxed{D_\mu q^a_\lambda = \partial_\mu q^a_\lambda + \omega^a_{\mu b} q^b_\lambda - \Gamma^\nu_{\mu\lambda} q^a_\nu = 0} \quad - (1)$$

using the notation of the text.

It follows from eqn (1) that:

$$D^\mu \left(D_\mu q^a_\lambda \right) = \partial^\mu \left(D_\mu q^a_\lambda \right) = 0, \quad - (2)$$

i.e

$$\partial^\mu \left(\partial_\mu q^a_\lambda + \omega^a_{\mu b} q^b_\lambda - \Gamma^\nu_{\mu\lambda} q^a_\nu \right) = 0, \quad - (3)$$

or

$$\Box q^a_\lambda = \partial^\mu \left(\Gamma^\nu_{\mu\lambda} q^a_\nu \right) - \partial^\mu \left(\omega^a_{\mu b} q^b_\lambda \right). \quad - (4)$$

Define:

$$R q^a_\lambda := \partial^\mu \left(\Gamma^\nu_{\mu\lambda} q^a_\nu \right) - \partial^\mu \left(\omega^a_{\mu b} q^b_\lambda \right) \quad - (5)$$

to obtain the Evans Lemma:

$$\boxed{\Box q^a_\lambda = R q^a_\lambda} \quad - (6)$$