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Sections of tangent tensor bundle on a smooth manifold

$$(\Gamma T^{r,s}T(M), +, \cdot)$$

Definition.

$$(\Gamma T^{r,s}T(M), +, \cdot)$$

$$\Gamma(T^{r,s}M) := \{ \text{set of all smooth sections of } T^{r,s}M \}$$

with addition and scalar multiplication defined pointwise

$$(\Gamma T^{\bullet,\bullet}T(M), +, \cdot, \otimes)$$

Definition.

$$(\Gamma T^{\bullet,\bullet}T(M), +, \cdot, \otimes)$$

$$\Gamma T^{\bullet,\bullet}T(M) := \bigoplus_{r,s \geq 0} \Gamma T^{r,s}T(M)$$

$\otimes$ is defined pointwise

it is

- graded $\mathbb{R}$ -algebra
- $\mathcal{C}^\infty(M)$ -module

identifications

multilinear maps

A (r, s) tensor $\leftrightarrow \mathcal{C}^\infty(M)$ -multilinear map $\Gamma(T^*M)^r \times \Gamma(TM)^s \rightarrow \mathcal{C}^\infty(M)$



$$\text{Mult}^{r+s} \text{Mod}_{\mathcal{C}^\infty(M)}(\Gamma(T^*M)^r \times \Gamma(TM)^s, \mathcal{C}^\infty(M)) \cong_{\text{Mod}_{\mathcal{C}^\infty(M)}} \Gamma T^{\bullet,\bullet}M$$

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