coincides with TX. Hence every vector field ξ on X is prolonged into a section $\xi^r : X \to L(\Pi^r X)$. If $e_j^i, \ldots, e_j^{i_1 \ldots i_r}$ is the canonical basis of the r-th differential group L_n^r and $\xi \equiv \xi^i(x) (\partial/\partial x^i)$, then we find by iterating (18)

$$\xi^r \equiv \xi^j \frac{\partial}{\partial x^j} + \frac{\partial \xi^j}{\partial x^i} e_j^i + \ldots + \frac{\partial^r \xi^j}{\partial x^{i_1} \ldots \partial x^{i_r}} e_j^{i_1 \ldots i_r} . \tag{28}$$

Further, let Y be a fibered manifold associated with $\Pi^r X$ and σ a section of Y. Then $L_{\xi^r}\sigma =: L_\xi \sigma$ is called the Lie derivative of σ with respect to ξ. Moreover, if $A_j^{pi}(y), \ldots$ $\ldots, A_j^{pi_1 \ldots i_r}(y)$ are the vector fields on the standard fiber F of Y corresponding to $e_j^i, \ldots, e_j^{i_1 \ldots i_r}$, then we obtain by (24) and (28)

$$L_\xi \sigma \equiv \frac{\partial \sigma^p}{\partial x^i} \xi^i - A_j^{pi}(\sigma) \frac{\partial \xi^j}{\partial x^i} - \ldots - A_j^{pi_1 \ldots i_r}(\sigma) \frac{\partial^r \xi^j}{\partial x^{i_1} \ldots \partial x^{i_r}} . \tag{29}$$

This formula covers the classical cases of Lie differentiation.

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Author's address: 662 95 Brno, Janáčkovo nám. 2a (Matematický ústav ČSAV, pobočka Brno).