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THEORY OF LIE GROUPS

I

Some Notations Used in This Book

I. We denote by ϕ the empty set, by $\{a\}$ the set composed of the single element a.

If f is a mapping of a set A into a set B, and if X is a sub-set of B, we denote by $\overset{-1}{f}(X)$ the set of the elements $a \epsilon A$ such that $f(a) \epsilon X$. If g is a mapping of B into a third set C, we denote by $g \circ f$ the mapping which assigns to every $a \epsilon A$ the element $g(f(a))$.

We use the signs $\cup$, $\cap$ to represent respectively the intersection and the union of sets. If E_α is a collection of sets, the index α running over a set A, we denote by $\bigcup_{\alpha \epsilon A} E_\alpha$ the union of all sets E_α and by $\bigcap_{\alpha \epsilon A} E_\alpha$ their intersection. We denote by δ_{ij} the Kronecker symbol, equal to 1 if $i = j$ and to 0 if $i \neq j$.

II. If G is a group, we call "neutral element" the element ϵ of G such that $\epsilon\sigma = \sigma$ for every $\sigma \epsilon G$.

We say that a sub-group H of G is "distinguished" if the conditions $\sigma \epsilon G$, $\tau \epsilon H$ imply $\tau\sigma\tau^{-1} \epsilon H$.

If $\sigma = (a_{ij})$ represents a matrix, the symbol $\boxed{\sigma} = \boxed{a_{ij}}$ stands for the determinant of the matrix; $\delta p \sigma$ stands for the trace of the matrix.

If $\mathfrak{M}$, $\mathfrak{N}$ are vector spaces over the same field K, we call *product* of $\mathfrak{M}$ and $\mathfrak{N}$, and denote by $\mathfrak{M} \times \mathfrak{N}$, the set of the pairs $(\mathbf{e}, \mathbf{f})$ with $\mathbf{e} \epsilon \mathfrak{M}$, $\mathbf{f} \epsilon \mathfrak{N}$, this set being turned in a vector space by the conventions

$$(\mathbf{e}, \mathbf{f}) + (\mathbf{e}', \mathbf{f}') = (\mathbf{e} + \mathbf{e}', \mathbf{f} + \mathbf{f}')$$

$$a(\mathbf{e}, \mathbf{f}) = (a\mathbf{e}, a\mathbf{f}) \qquad \text{for } a \epsilon K.$$

III. *Topology.* We call topological spaces only the spaces in which Hausdorf separation axiom is satisfied.

A neighbourhood of a point p in space $\mathfrak{B}$ is understood to be a set N such that there exists an open set U such that $p \in U \subset N$; N need not be open itself.

The adherence $\bar{A}$ of a set A in a topological space is the set of those points p such that every neighbourhood of p meets A. Every point of $\bar{A}$ is said to be adherent to A. We shall make use of the possibility of defining the topology in a space by the operation $A \rightarrow \bar{A}$ of adherence (cf. Alexandroff-Hopf, *Topologie*, Kap. 1).

Intervals. If a and b are real numbers such that $a \leqslant b$, we denote by $]a, b[$ the open interval of extremities a and b. We set $]a, b] =]a, b[\cup \{b\}$, $[a, b[=]a, b[\cup \{a\}$, $[a, b] =]a, b[\cup \{a\} \cup \{b\}$.