

# Compendium of Mathematics & Physics

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# List of Symbols

The following symbols are used throughout the summary:

## Abbreviations

AIC	Akaike information criterion
ARMA	autoregressive moving-average model
BCH	Baker-Campbell-Hausdorff
CCR	canonical commutation relation
CDF	cumulative distribution function
CFT	conformal field theory
CIS	completely integrable system
CP	completely positive
CPTP	completely positive, trace-preserving
CR	Cauchy-Riemann
DGA	differential graded algebra
DGCA	differential graded-commutative algebra
EPR	Einstein-Podolsky-Rosen
ETCS	Elementary Theory of the Category of Sets
FWHM	full width at half maximum
GA	geometric algebra
GHZ	Greenberger-Horne-Zeilinger
GNS	Gel'fand-Naimark-Segal
HoTT	Homotopy Type Theory
KKT	Karush-Kuhn-Tucker
LIVF	left-invariant vector field
MPO	matrix product operator
MPS	matrix product state
MTC	modular tensor category
NDR	neighbourhood deformation retract
OPE	operator product expansion
OZI	Okubo-Zweig-Iizuka
PAC	probably approximately correct
PL manifold	piecewise-linear manifold
PVM	projection-valued measure

RKHS	reproducing kernel Hilbert space
SVM	support-vector machine
TQFT	topological quantum field theory
VIF	variance inflation factor
ZFC	Zermelo-Frenkel set theory with the axiom of choice
TVS	topological vector space

**Operations**

$\text{Ad}_g$	adjoint representation of a Lie group $G$
$\text{ad}_X$	adjoint representation of a Lie algebra $\mathfrak{g}$
$\arg$	argument of a complex number
$\square$	d'Alembert operator
$\deg(f)$	degree of the polynomial $f$
$e$	identity element of a group
$\Gamma(E)$	set of global sections of a fibre bundle $E$
$\text{Im}$	imaginary part of a complex number
$\text{Ind}_f(z)$	index of a point $z \in \mathbb{C}$ with respect to a function $f$
$\hookrightarrow$	injective function
$\cong$	is isomorphic to
$\text{Par}_t^\gamma$	parallel transport map with respect to the curve $\gamma$
$\text{Re}$	real part of a complex number
$\text{Res}$	residue of a complex function
$\twoheadrightarrow$	surjective function
$\{\cdot, \cdot\}$	Poisson bracket
$\partial X$	boundary of a topological space $X$
$\overline{X}$	closure of a topological space $X$
$X^\circ, \overset{\circ}{X}$	interior of a topological space $X$
$\angle(\cdot, \cdot)$	angle between two vectors
$X \times Y$	cartesian product of the sets $X$ and $Y$
$X + Y$	sum of the vector spaces $X$ and $Y$
$X \oplus Y$	direct sum of the vector spaces $X$ and $Y$
$V \otimes W$	tensor product of the vector spaces $V$ and $W$
$\mathbb{1}_X$	identity morphism on the object $X$
$\approx$	is approximately equal to
$\hooksubset$	is included in
$\cong$	is isomorphic to
$\mapsto$	mapsto

**Collections**

$\text{Ab}$	category of Abelian groups
$\text{Aut}(X)$	automorphism group of an object $X$
$\mathcal{B}_0(V, W)$	space of compact bounded operators between the Banach spaces $V$ and $W$

$\mathcal{B}(V, W)$	space of bounded linear maps from the space $V$ to the space $W$
$\mathbf{CartSp}$	the category of Euclidean spaces and “suitable” homomorphisms (e.g. linear maps, smooth maps, ...)
$C_\bullet$	chain complex
$\mathbf{Ch}(\mathbf{A})$	category of chain complexes with objects in the additive category $\mathbf{A}$
$\mathbf{C}^\infty$	category of smooth spaces
$C_p^\infty(M)$	ring of smooth functions $f : M \rightarrow \mathbb{R}$ on a neighbourhood of $p \in M$
$C^\omega(V)$	the set of all analytic functions defined on the set $V$
$\mathbf{Conf}(M)$	conformal group of (pseudo-)Riemannian manifold $M$
$C(X, Y)$	set of continuous functions between two topological spaces $X$ and $Y$
$\mathbf{C}^\infty\mathbf{Ring}, \mathbf{C}^\infty\mathbf{Alg}$	category of smooth algebras
$\mathbf{Diff}$	category of smooth manifolds
$\mathbf{DiffSp}$	category of diffeological spaces and smooth maps
$D^n$	standard $n$ -disk
$\mathrm{dom}(f)$	domain of a function $f$
$\mathrm{End}(X)$	endomorphism monoid of a an object $X$
$\mathcal{E}\mathrm{nd}$	endomorphism operad
$\mathbf{FormalCartSp}_{\mathrm{diff}}$	category of infinitesimally thickened Euclidean spaces
$\mathrm{GL}(V)$	general linear group, the group of automorphisms of a vector space $V$
$\mathrm{GL}(n, K)$	general linear group: the group of all invertible $n \times n$ -matrices over the field $K$
$\mathbf{Grp}$	category of groups and group homomorphisms
$\mathbf{Grpd}$	category of groupoids
$\mathrm{Hol}_p(\omega)$	holonomy group at the point $p$ with respect to the principal connection $\omega$
$\mathrm{Hom}_{\mathbf{C}}(V, W)$	set of homomorphisms from an object $V$ to an object $W$ in a category $\mathbf{C}$
$\mathbf{hTop}$	homotopy category
$\mathrm{im}(f)$	image of a function $f$
$K^0(X)$	$K$ -theory over a (compact Hausdorff) space $X$
$\mathbf{Kan}$	category of Kan complexes
$\mathcal{K}_n(A, v)$	Krylov subspace of dimension $n$ generated by the matrix $A$ and the vector $v$
$L^1$	space of integrable functions
$\mathbf{Law}$	category of Lawvere theories
$\mathbf{Lie}$	category of Lie groups
$\mathfrak{Lie}$	category of Lie algebras
$\mathfrak{X}^L$	space of left-invariant vector fields on a Lie group
$LX$	free loop space on $X$
$\mathbf{Man}^p$	category of $C^p$ -manifolds
$\mathbf{Meas}$	category of measure spaces and measure-preserving functions
$N\mathbf{C}$	the simplicial nerve of a small category $\mathbf{C}$
$\mathbf{Open}(X)$	category of open subsets of a topological space $X$
$O(n, K)$	group of $n \times n$ orthogonal matrices over a field $K$
$P(S), 2^S$	power set of $S$

$\text{Pin}(V)$	pin group of the Clifford algebra $C\ell(V, Q)$
$\mathbf{Psh}(\mathbf{C}), \hat{\mathbf{C}}$	category of presheaves on a (small) category $\mathbf{C}$
$\mathbf{Sh}(X)$	category of sheaves on a topological space $X$
$\mathbf{Sh}(\mathbf{C}, J)$	category of $J$ -sheaves on a site $(\mathbf{C}, J)$
$\Delta$	simplex category
$\text{SL}_n(K)$	special linear group: group of all invertible $n$ -dimensional matrices with unit determinant over the field $K$
$S^n$	standard $n$ -sphere
$S^n(V)$	space of symmetric rank $n$ tensors over a vector space $V$
$W^{m,p}(U)$	the Sobolov space in $L^p$ of order $m$
$\mathbf{Span}(\mathbf{C})$	span category over $\mathbf{C}$
$\text{Spec}(R)$	spectrum of a commutative ring $R$
$\text{supp}(f)$	support of a function $f$
$\text{Syl}_p(G)$	set of Sylow $p$ -subgroups of a finite group $G$
$S_n$	symmetric group of degree $n$
$\text{Sym}(X)$	symmetric group on the set $X$
$\text{Sp}(n, K)$	group of matrices preserving a canonical symplectic form over the field $K$
$\text{Sp}(n)$	compact symplectic group
$\text{TL}_n(\delta)$	Temperley-Lieb algebra with $n - 1$ generators and parameter $\delta$ .
$T^n$	standard $n$ -torus (the $n$ -fold Cartesian product of $S^1$ )
<b>Top</b>	category of topological spaces
<b>Topos</b>	the 2-category of (elementary) topoi and geometric morphisms
$U(\mathfrak{g})$	universal enveloping algebra of a Lie algebra $\mathfrak{g}$
$U(n, K)$	group of $n \times n$ unitary matrices over a field $K$
$\mathbf{Vect}(X)$	category of vector bundles over a manifold $X$
$\mathbf{Vect}_K$	category of vector spaces and linear maps over a field $K$
$Y^X$	set of functions from a set $X$ to a set $Y$
$\emptyset$	empty set
$\pi_n(X, x_0)$	$n^{\text{th}}$ homotopy space over $X$ with basepoint $x_0$
$[a, b]$	closed interval
$]a, b[$	open interval
$\Lambda^n(V)$	space of antisymmetric rank $n$ tensors over a vector space $V$
$\Omega X$	(based) loop space on $X$
$\Omega^k(M)$	$C^\infty(M)$ -module of differential $k$ -forms on the manifold $M$
$\rho(A)$	resolvent set of a bounded linear operator $A$
$\mathfrak{X}(M)$	$C^\infty(M)$ -module of vector fields on the manifold $M$
<b>Units</b>	
C	coulomb
T	tesla

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