Linear algebra notation

Vector spaces

$\operatorname{span}(S)$	span of set S
$\dim(V)$	dimension of vector space V
$U_1 + U_2$	sum of subspaces U_1 and U_2
$U_1 \oplus U_2$	direct sum of subspaces U_1 and U_2

Array spaces

$\mathbb{F}^n$ (over $\mathbb{F}$)	n-tuples with entries in field $\mathbb{F}$
$\mathbb{F}^{m \times n}$ (over $\mathbb{F}$)	$m \times n$ matrices with entries in field $\mathbb{F}$

Function spaces

$L(V, W)$ (over $\mathbb{F}$)	linear maps from vector space V to vector space W
$L(V)$ (over $\mathbb{F}$)	linear maps from vector space V to itself
$P(\mathbb{F})$ (over $\mathbb{F}$)	polynomials with coefficients in field $\mathbb{F}$
$P_n(\mathbb{F})$ (over $\mathbb{F}$)	polynomials of degree at most n with coefficients in field $\mathbb{F}$
$C(X)$ (over $\mathbb{R}$ or $\mathbb{C}$)	continuous functions on set X with values in $\mathbb{R}$ or $\mathbb{C}$
$C^\infty(X)$ (over $\mathbb{R}$ or $\mathbb{C}$)	smooth (i.e., infinitely differentiable) functions on set X with values in $\mathbb{R}$ or $\mathbb{C}$

Sequence spaces

$\mathbb{F}^{\mathbb{N}}$ (over $\mathbb{F}$)	sequences in field $\mathbb{F}$
$\mathbb{F}^\infty$ (over $\mathbb{F}$)	sequences in field $\mathbb{F}$ with finitely many nonzero terms

Linear maps

$\ker(T)$	kernel of linear map T
$\operatorname{im}(T)$	image of linear map T
$\operatorname{null}(T)$	nullity of linear map T
$\operatorname{rank}(T)$	rank of linear map T
I, I_V	identity map on vector space V
T^{-1}	inverse of linear map T

Matrices

${}_B[v]$	matrix of vector v with respect to basis B
${}_{B'}[T]_B$	matrix of linear map T with respect to bases B and B'
a_{ij}	(i, j)-entry of matrix A
A^T	transpose of matrix A
$\det(A)$, $\det(a_1, \ldots, a_n)$	determinant of matrix A with columns $a_1, \ldots, a_n$ (also used for linear maps)
$\operatorname{sgn}(\sigma)$	sign of permutation σ

e_i	i^{th} standard basis vector of $\mathbb{F}^n$
$\operatorname{tr}(A)$	trace of matrix A (also used for linear maps)

Eigenvalues and eigenvectors

$E_T(\lambda)$	eigenspace of eigenvalue λ of linear map T
$\gamma_T(\lambda)$	geometric multiplicity of eigenvalue λ of linear map T
$\alpha_T(\lambda)$	algebraic multiplicity of eigenvalue λ of linear map T
χ_T	characteristic polynomial of linear map T
μ_T	minimal polynomial of linear map T

Normed and inner product spaces

$\|v\|$	norm of vector v
$\langle v, w\rangle$	inner product of vectors v and w
$\operatorname{proj}_w(v)$, $P_w(v)$	orthogonal projection of vector v onto span of vector w
$\operatorname{proj}_W(v)$, $P_W(v)$	orthogonal projection of vector v onto subspace W
$S^\perp$	orthogonal complement of set S
T^*	adjoint of linear map T
A^*	conjugate transpose of matrix A

Complex numbers

$\overline{z}$	complex conjugate of complex number z
$\|z\|$	absolute value of complex number z
$\Re(z)$	real part of complex number z
$\Im(z)$	imaginary part of complex number z

Norms and inner products

$\langle v, w\rangle_2$	standard inner/dot product of $v, w \in \mathbb{F}^n$ (where $\mathbb{F} \in \{\mathbb{R}, \mathbb{C}\}$) $\coloneqq \sum_{i=1}^{n} v_i \overline{w_i}$
$\|v\|_2$	standard/2- norm of $v, w \in \mathbb{F}^n$ (where $\mathbb{F} \in \{\mathbb{R}, \mathbb{C}\}$) $\coloneqq \langle v, v\rangle_2^{1/2}$