

Where vector spaces show up

Vector spaces are not only arrows: polynomials, matrices and functions form vector spaces too, and many familiar sets sit inside them as subspaces.

L0 Common vector spaces

L1 Finite-dimensional

L2 $\mathbb{R}^n$ n -tuples of real numbers

L2 $\mathcal{P}_n$ polynomials of degree at most n

$\dim n + 1$

L2 $m \times n$ matrices

$\dim mn$

L1 Infinite-dimensional

L2 Continuous functions on an interval

L1 Subspace examples

L2 Solutions of a homogeneous system

L2 Symmetric $n \times n$ matrices

L2 Polynomials with $p(0) = 0$

L2 Solutions of $y'' + y = 0$ basis $\cos x, \sin x$

Same axioms, very different objects

Anything that satisfies the axioms is a vector space, whatever its elements look like.

