Why

In some sense, $\mathbf{R}^n$ is the only finite-dimensional vector space. In what sense?

Definition

An *isomorphism* is an invertible linear transformation between two vector spaces. Two vector spaces are *isomorphic* if there exists and isomorphism between them.

Key result

Proposition 1. *Two finite-dimensional vector spaces are isomorphic if and only if they have the same dimension.*

Vector Space Isomorphisms

Vector Space Dimension

Vector Space Basis

Linearly Dependent Vectors — Span

Subspaces

Real Subspaces

Linear Transformations — Real Vector Span

Transformations — Linear Combinations — Real Linear Combinations

Vectors

Real Vector

Plane Vector Sums and Differences — Space Vectors — N-Dimensional Space

Plane Vectors — Distance

Space Distance

Plane Distance

Interval Length

Intervals — Real Space

Real Plane — Real Line

Real Order — Integral Line

Fields — Real Numbers — Rational Order — Geometry

Rings — Rational Numbers

Integer Arithmetic

Lists

Set Number — Natural Additive Identity — Natural Multiplicative Identity — Integer Products

Finite Sets — Identity Elements — Arithmetic

Direct Products — Equivalent Sets — Natural Powers

Family Unions and Intersections — Function Inverses — Comparisons — Integer Order — Integer Sums — Natural Products

Families — Function Composites — Function Images — Operations — Orders — Integer Numbers — Natural Sums

Functions — Converse Relations — Equivalence Relations — Natural Order — Recursion Theorem

Relations — Peano Axioms

Set Products — Natural Induction

Generalized Set Dualities — Set Powers — Natural Numbers

Set Unions and Intersections — Set Dualities — Unordered Triples — Successor Sets — Intersection of Empty Set — Partitions — Set Symmetric Differences

Ordered Pairs — Pair Unions — Set Intersection — Set Complements

Pair Intersections — Set Unions — Set Differences

Unordered Pairs — Empty Set

Set Specification

Set Equality

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities — Sets

Names

Letters — Objects