Definition

A cone $K \subset \mathbf{R}^n$ is *proper* if it is (a) convex, (b) closed, (c) solid, and (d) pointed. A cone is solid if its interior is nonempty. A cone is *pointed* if it contains no line.

$$x \in K, -x \in K \Rightarrow x = 0.$$

In this case, we call K *proper cone*.

Example

The nonnegative orthant is a proper cone.

Proper Real Cones

Convex Real Cones

Real Convex Sets

Topological Interior

Real Halfspaces

Real Hyperplanes

Subspace Orthogonal Complements

Subspace Dimensions

Vector Space Dimensions

Vector Space Bases

Affine Set Dimensions

Span   Linearly Dependent Vectors   Orthogonal Complements   Affinely Independent Vectors

Real Subspace Dimensions   Vector Subspaces   Real Affine Hulls   Real Affine Sets and Subspaces

Vectors as Matrices   Real Vector Bases   Real Subspaces   Linear Combinations   Real Inner Products   Real Affine Sets   Topological Closure   N-Dimensional Line Segments

Real Matrices   Independent Set of Real Vectors   Real Vectors Span   Vectors   Real Inner Product   Real Affine Combinations   N-Dimensional Lines   Real Translations   Topological Neighborhoods

Real Linear Equations   Real Linear Combinations   Real Vectors   Space Inner Product   Real Set Closure   Topology   N-Dimensional Space   Metrics

Arrays   Linear Functions   Real Norm   Space Norm   Real Limits   Distance

Plane Vector Sums and Differences   Space Vectors   Plane Norm   Plane Inner Product   Absolute Value   Right Triangle Sides Relation   Distance

Plane Vectors   Real Square

Space Distance   Real Arithmetic

Plane Distance   Real Multiplicative Inverses

Interval Length   Real Square

Real Addition Inverses   Real Products   Intervals   Real Space

Real Sequences   Real Summation   Real Sums   Rational Multiplicative Inverses   Real Order   Rational Arithmetic   Integral Line   Square Numbers

Sequences   Natural Summation   Real Numbers   Rational Products   Rational Sums   Fields   Rational Order   Geometry

Lists   Set Numbers   Rational Numbers   Rings

Direct Products   Natural Functions   Integer Arithmetic

Finite Sets   Natural Addition Identity   Natural Multiplicative Identity   Natural Arithmetic   Integer Products

Inverse Elements   Equivalent Sets   Identity Elements   Natural Powers

Function Images   Element Function   Compactness   Natural Equations   Integer Order   Integer Sums   Natural Powers

Families   Function Inverses   Equations   Orders   Integer Products   Natural Numbers   Natural Products

Family Operations   Function Composition   Concrete Relation   Equivalence Relation   Natural Order   Natural Sums

Functions   Relations   Recursion Theorem

Ordered Pair Projections   Peano Axioms

Set Products   Natural Induction

Generalized Set Dualities   Set Powers   Natural Numbers

Set Dualities   Unordered Triples   Successor Sets   Intersection of Empty Set   Partitions   Set Symmetric Differences

Set Unions and Intersections   Ordered Pairs   Pair Unions   Set Intersections   Set Complements

Pair Intersections   Unordered Pairs   Empty Set   Set Differences

Set Specification   Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Identities   Sets

Names

Letters   Objects

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