Why

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Definition

Let $A \in \mathbf{R}^{n \times n}$ be symmetric. A is *positive definite* if, for all $x \in \mathbf{R}^d$, $x \neq 0$, $x^\top A x > 0$. A is *positive semidefinite* (or *nonnegative definite*) if, for all $x \in \mathbf{R}^d$, $x^\top A x \geq 0$.

Notation

We denote the set of real-valued positive definite d by d matrices by $\mathbf{S}^d_{++}$. We denote the set of real-valued positive semidefinite d by d matrices by $\mathbf{S}^d_+$.

Characterizations

Proposition 1. *Let $A \in \mathbf{S}^d$ and denote the smallest*

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[1]Future editions will elaborate.

Positive Definite Matrices

Quadratic Forms   Symmetric Matrices

Matrix Trace

Matrix-Matrix Products   Matrix Transpose

Identity Matrices   Real Matrices   Matrix-Vector Products

Real Vectors   Matrices   Linear Combinations

Vectors

N-Dimensional Space

Distance

Space Distance

Plane Distance

Interval Length

Intervals

Real Line   Real Plane   Real Space

Real Order   Integral Line   Sequences

Fields   Real Numbers   Geometry   Set Numbers   Direct Products

Groups   Rational Numbers

Integer Additive Inverses   Integer Arithmetic

Finite Sets

Integer Sums   Inverse Elements   Natural Multiplicative Identity   Natural Additive Identity

Element Functions   Arithmetic   Identity Elements   Equivalent Sets

Integer Products   Natural Power   Function Inverses   Algebras   Family Unions and Intersections

Integer Numbers   Natural Products   Function Composites   Function Images   Operations   Families

Natural Sums   Equivalence Relations   Functions

Recursion Theorem   Relations   Natural Order

Peano Axioms

Natural Induction

Set Products   Generalized Set Dualities

Natural Numbers   Set Powers

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

Ordered Pairs   Pair Unions   Set Intersections   Set Complements

Set Differences   Set Unions   Pair Intersections

Unordered Pairs   Empty Set

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities   Sets

Names

Letters   Objects