Definition

Let $A \in \mathbf{S}^n$ (i.e., $A \in \mathbf{R}^{n \times n}$ and symmetric). A is *positive definite* if, for all $x \neq 0 \in \mathbf{R}^d$,

$$x^\top A x > 0.$$

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


Positive Definite Matrices
Quadratic Forms
Identity Matrices
Matrix Trace
Symmetric Real Matrices
Real Matrix-Matrix Products
Matrix Transpose
Real Matrix-Vector Products
Matrices
Vectors as Matrices
Real Matrices
Real Inner Product
Real Linear Combinations
Multivariate Polynomials
Vectors
Linear Equations
Real Norms
Real Vectors
Linear Functions
Multivariate Functions
Space Norms
N-Dimensional Space
Plane Inner Product
Plane Vector Sums and Differences
Space Vectors
Plane Norm
Plane Vectors
Absolute Value
Distance
Right Triangle Sides Relation
Real Polynomials
Arrays
Space Distance
Real Squares
Real Arithmetic
Plane Distance
Real Multiplicative Inverses
Interval Length
Real Products
Intervals
Real Space
Real Additive Inverses
Real Line
Real Plane
Square Numbers
Real Summation
Rational Arithmetic
Real Sums
Rational Multiplicative Inverses
Real Order
Integral Line
Squares
Fields
Rational Sums
Real Numbers
Rational Products
Rational Order
Geometry
Rings
Rational Numbers
Integer Arithmetic
Lists
Natural Multiplicative Identity
Natural Additive Identity
Integer Products
Set Numbers
Identity Elements
Arithmetic
Direct Products
Finite Sets
Natural Summation
Natural Powers
Inverse Elements
Equivalent Sets
Natural Equations
Family Operations
Element Functions
Natural Products
Integer Sums
Integer Order
Function Inverses
Comparisons
Family Unions and Intersections
Equations
Operations
Natural Sums
Integer Numbers
Function Composites
Function Images
Families
Orders
Recursion Theorem
Functions
Natural Order
Converse Relations
Equivalence Relations
Peano Axioms
Relations
Natural Induction
Set Products
Natural Numbers
Set Powers
Generalized Set Dualities
Set Symmetric Differences
Successor Sets
Unordered Triples
Set Dualities
Intersection of Empty Set
Partitions
Set Unions and Intersections
Ordered Pairs
Set Complements
Pair Unions
Set Intersections
Set Differences
Set Unions
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects