Definition

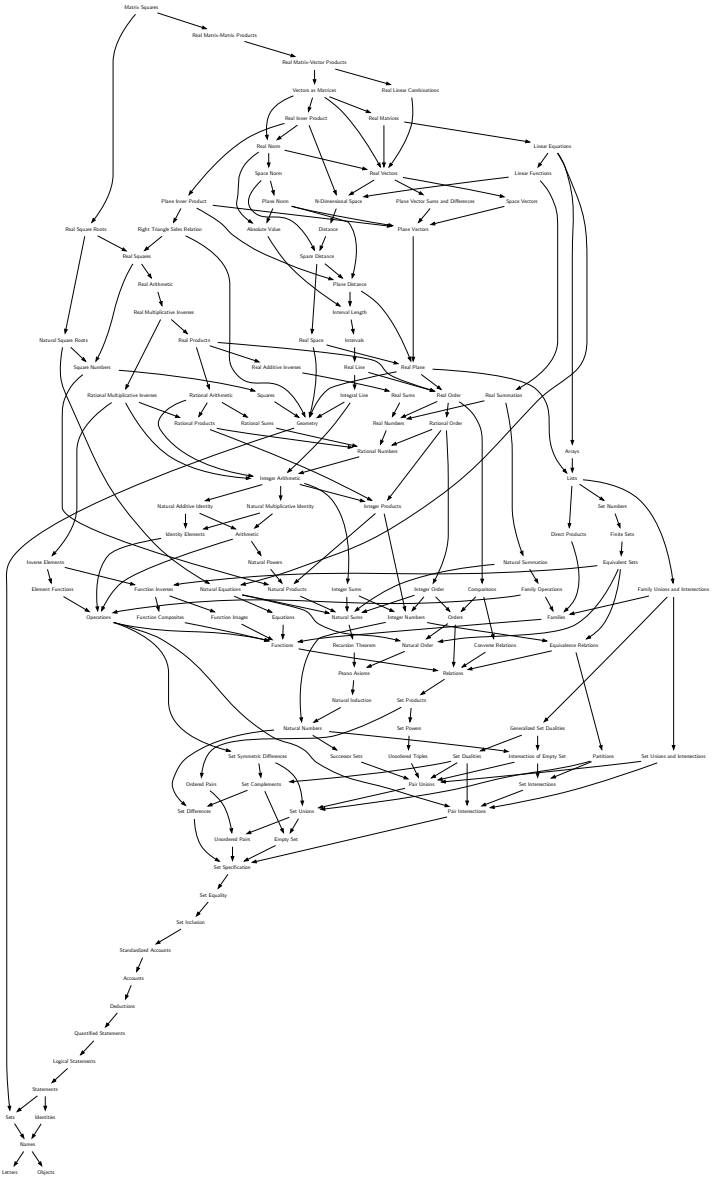
The *square* of a square matrix is the product of the matrix with itself. A *square root* (or *matrix square root*) of a given matrix is a matrix whose square is the given matrix. A matrix is *idempotent* if it is equal to its square.

Notation

Let $A \in \mathbf{R}^{n \times n}$. Then the square of A is AA. We denote the square of A by A^2. A is idempotent if $A^2 = A$. $B \in \mathbf{R}^{n \times n}$ is a square root of A if $A = B^2$.

Existence and uniqueness

Clearly a matrix can have a square root. Take for example the matrix in $\mathbf{R}^{1 \times 1}$ $\begin{bmatrix} 1 \end{bmatrix}$. A square root of this matrix is $\begin{pmatrix} 1 \end{pmatrix}$, but also $\begin{pmatrix} -1 \end{pmatrix}$. So matrix square roots do exist, but are not unique.


Matrix Squares
Real Matrix-Matrix Products
Real Matrix-Vector Products
Vectors as Matrices
Real Linear Combinations
Real Inner Product
Real Matrices
Linear Equations
Real Norm
Real Vectors
Space Norm
Linear Functions
Plane Inner Product
Plane Norm
N-Dimensional Space
Plane Vector Sums and Differences
Space Vectors
Real Square Roots
Right Triangle Sides Relation
Absolute Value
Distance
Plane Vectors
Real Squares
Space Distance
Real Arithmetic
Plane Distance
Real Multiplicative Inverses
Interval Length
Natural Square Roots
Real Products
Real Space
Intervals
Square Numbers
Real Additive Inverses
Real Line
Real Plane
Rational Multiplicative Inverses
Rational Arithmetic
Squares
Integral Line
Real Sums
Real Order
Real Summation
Rational Products
Rational Sums
Geometry
Real Numbers
Rational Order
Rational Numbers
Arrays
Integer Arithmetic
Lists
Natural Additive Identity
Natural Multiplicative Identity
Integer Products
Set Numbers
Identity Elements
Arithmetic
Direct Products
Finite Sets
Inverse Elements
Natural Powers
Natural Summation
Equivalent Sets
Element Functions
Function Inverses
Natural Equations
Natural Products
Integer Sums
Integer Order
Comparisons
Family Operations
Family Unions and Intersections
Operations
Function Composites
Function Images
Equations
Natural Sums
Integer Numbers
Orders
Families
Functions
Recursion Theorem
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
Sets
Identities
Names
Letters
Objects