Matrix Squares

Why

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.

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[1]Future editions will include an account.

Matrix Squares

Matrix-Matrix Products

Matrices

Vectors

N-Dimensional Space

Distance

Space Distance

Plane Distance

Interval Length

Intervals

Real Space   Real Plane   Real Line

Direct Products   Geometry   Real Order

Fields   Real Sums   Rational Arithmetic   Rational Multiplicative Inverse

Real Square Roots

Real Arithmetic

Real Multiplicative Inverse

Real Products

Real Additive Inverses

Families

Groups   Real Numbers   Rational Sums   Rational Products

Rational Numbers

Integer Additive Inverses

Integer Arithmetic

Inverse Elements

Element Functions   Natural Additive Identity   Natural Multiplicative Identity   Integer Sums   Integer Products

Natural Square Roots

Function Inverse   Algebras   Identity Elements   Arithmetic

Natural Exponents   Square Numbers

Function Composites   Function Images   Operations

Natural Products   Squares

Functions

Natural Sums   Integer Numbers

Recursion Theorem   Equivalence Relations

Relations   Peano Axioms

Cartesian Products   Natural Induction

Set Powers   Natural Numbers

Unordered Triples   Successor Sets   Intersection of Empty Set   Partitions

Ordered Pairs   Pair Unions   Set Intersections

Set Differences   Set Unions

Unordered Pairs   Empty Set   Pair Intersections

Set Specification   Equation Solutions

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Sets   Identities

Names

Letters   Objects

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