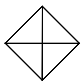


Why

We can add and scale matrices, so the $m \times n$ matrices are a vector space over $\mathbf{R}$.

Definition

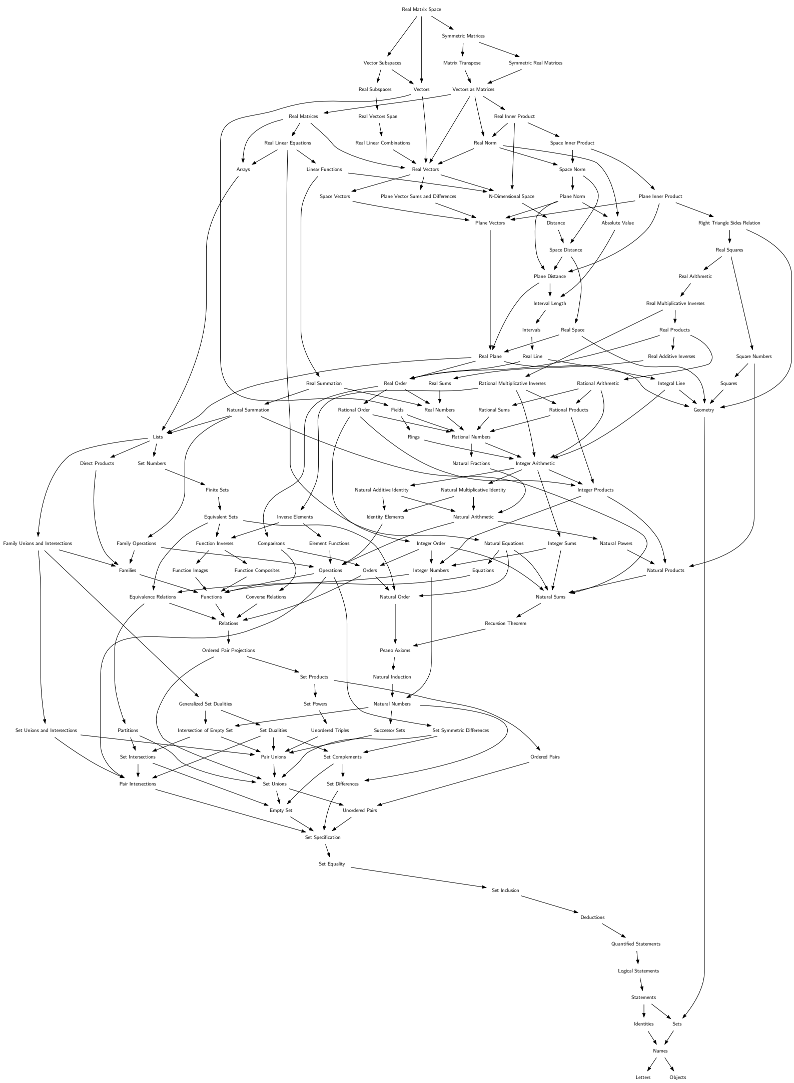
The *matrix sum* of two matrices $A, B \in \mathbf{R}^{m \times n}$ is the matrix $C \in \mathbf{R}^{m \times n}$ defined by $C_{ij} = A_{ij} + B_{ij}$. In other words, the matrix C is given by summing the entries of A and B "entry-wise". We denote the matrix sum by $A + B$.

For $\alpha \in \mathbf{R}$, the *α-scaling* of $A \in \mathbf{R}^{m \times n}$ is the matrix $C \in \mathbf{R}^{m \times n}$ defined by $C_{ij} = \alpha A_{ij}$. In other words, the matrix C is given by scaling the entries of A "entry-wise". We denote the α-scaled version of A by αA. These two definitions are justified by the following.

The *matrix space* (or *matrix vector space*) is the vector space $\mathbf{R}^{m \times n}$ in which addition is given by the matrix sums and scalar multiplication by entry-wise scaling. Sometimes we reference explicitly the *$m \times n$ matrix space.*

Subspaces of symmetric matrices

Consider the space of square matrices $\mathbf{R}^{n \times n}$. It is obvious that the subset of symmetric matrices is a subspace. Adding two symmetric matrices gives a symmetric matrix. Scaling a symmetric matrix by a real number gives a symmetric matrix. The matrix all of whose entries are 0 is symmetric.



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