Why

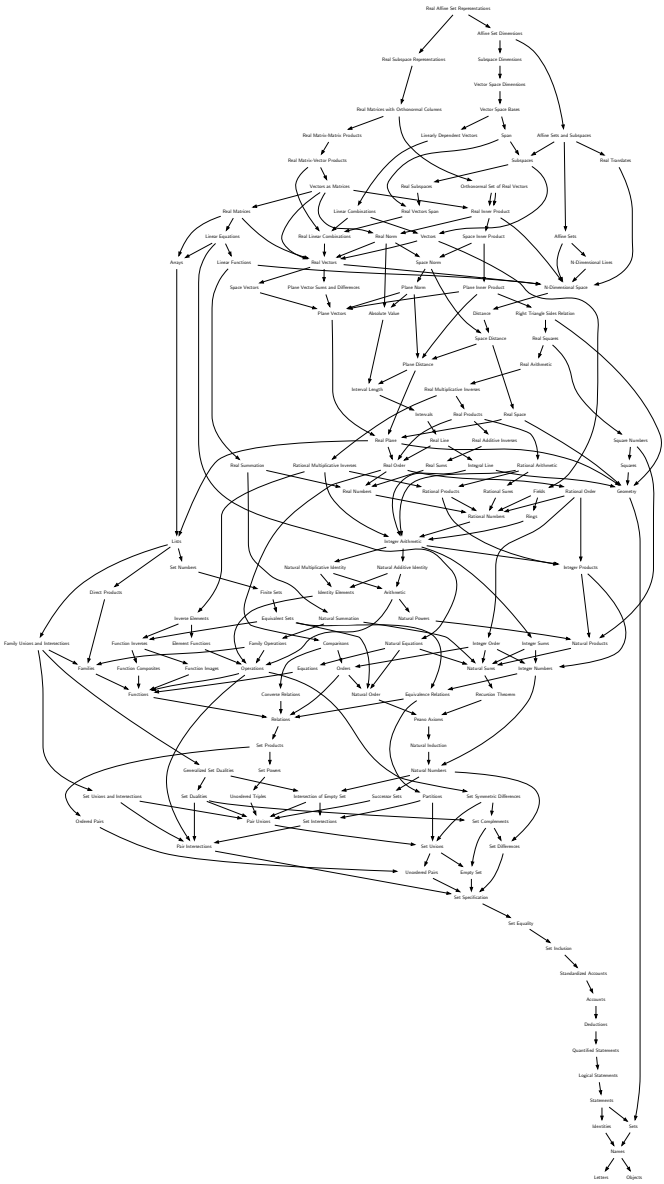
Since every affine set is a translate of a unique subspace, we can represent them by representing the vector and the subspace.

Definition

Recall that M is affine means $M = S + a$ for some subspace S and vector $a \in \mathbf{R}^n$. The dimension of M is the dimension of the subspace. Suppose $\dim S = k$, then there exists $Q \in \mathbf{R}^{n \times k}$ with $Q^\top Q = I$, so that for any $x \in S$, there exists unique $z \in \mathbf{R}^k$ with $x = Qz$. Since $M = S + a$, we have

$$M = \{y \in \mathbf{R}^n \mid (\exists z \in \mathbf{R}^k)(y = a + Qz)\}$$

We also denote this set $\{a + Qz \mid z \in \mathbf{R}^k\}$.


Real Affine Set Representations
Affine Set Dimensions
Real Subspace Representations
Subspace Dimensions
Vector Space Dimensions
Real Matrices with Orthonormal Columns
Vector Space Bases
Real Matrix-Matrix Products
Linearly Dependent Vectors
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Affine Sets and Subspaces
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Affine Sets
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Plane Vector Sums and Differences
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Absolute Value
Distance
Right Triangle Sides Relation
Space Distance
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Plane Distance
Real Arithmetic
Interval Length
Real Multiplication Inverses
Intervals
Real Products
Real Space
Square Numbers
Real Plane
Real Line
Real Additive Inverses
Squares
Real Summation
Rational Multiplicative Inverses
Real Order
Real Term
Integral Line
Rational Arithmetic
Real Numbers
Rational Products
Rational Sums
Fields
Rational Order
Geometry
Rational Numbers
Rings
Integer Arithmetic
Lists
Set Numbers
Natural Multiplication Identity
Natural Additive Identity
Integer Products
Direct Products
Finite Sets
Identity Elements
Arithmetic
Inverse Elements
Equivalent Sets
Natural Summation
Natural Powers
Family Unions and Intersections
Function Inverses
Element Functions
Family Operations
Comparisons
Natural Equations
Integer Order
Integer Sums
Natural Products
Function Composites
Function Images
Operations
Equations
Orders
Natural Sums
Integer Numbers
Cardinal
Functions
Converse Relations
Natural Order
Equivalence Relations
Recursion Theorems
Relations
Peano Axioms
Set Products
Natural Induction
Generalized Set Duality
Set Powers
Natural Numbers
Set Unions and Intersections
Set Duality
Unordered Triples
Intersection of Empty Set
Successor Sets
Functions
Set Symmetric Differences
Ordered Pairs
Pair Unions
Set Intersections
Set Complements
Pair Intersections
Set Unions
Set Differences
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects