Why

We want to measure angles in space.[1]

Definition

The *real inner product* (or *dot product*, *scalar product*) of two real vectors $x, y \in \mathbf{R}^n$ is

$$x_1y_1 + x_2y_2 + \cdots + x_ny_n$$

We denote the inner product of x and y by $\langle x, y\rangle$.

Properties

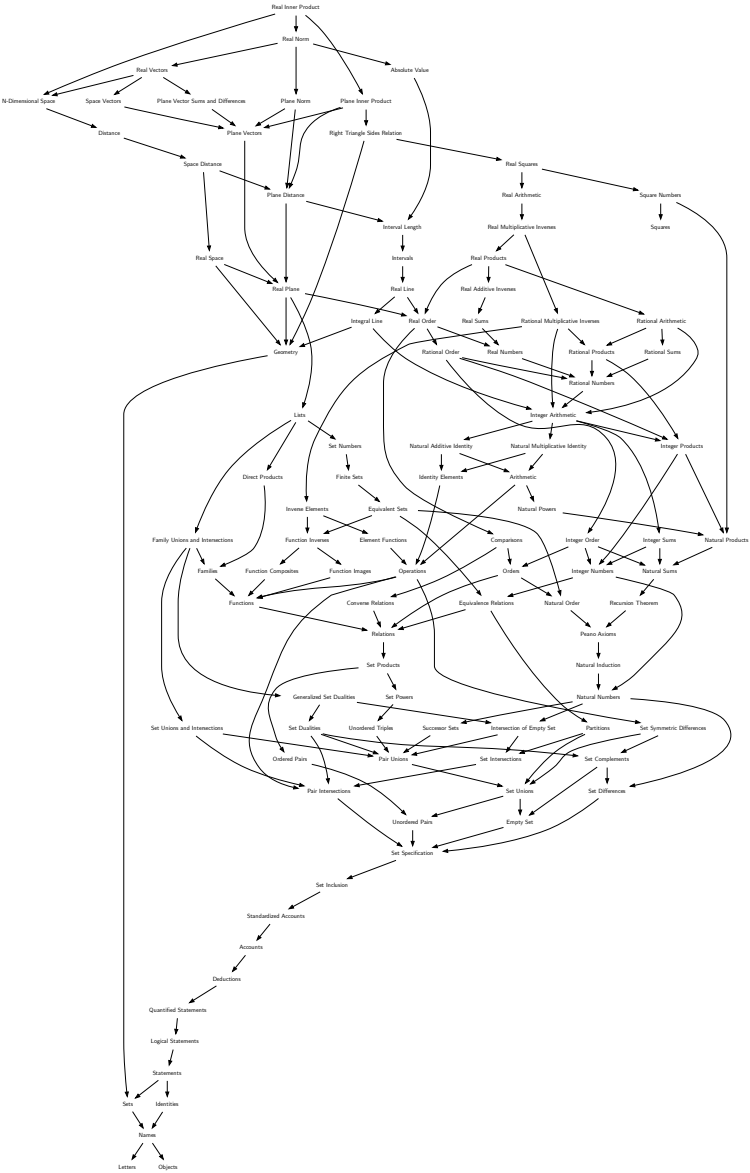
The inner product has several important properties

1. $\langle \alpha x, y\rangle = \alpha\langle x, y\rangle$
2. $\langle x + y, z\rangle = \langle x, z\rangle + \langle y, z\rangle$
3. $\langle x, y\rangle = \langle y, x\rangle$
4. $\langle x, x\rangle \geq 0$
5. $\langle x, x\rangle = 0 \longleftrightarrow x = 0$

Connection to norm

It is important to note that $\|x\| = \sqrt{\langle x, x\rangle}$.

[1] Future editions will expand, and perhaps give the development for $\mathbf{R}^2$ first. Future editions will include pictures.


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