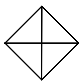


## Why

Lots of things are (approximately) linear.[1]

## Definition

A function between two vector spaces which share the same field is *linear* if the function applied to a linear combination of two vectors in the first space is the linear combination of the results of the function (in the second space), using the same coefficients for the combination.

A linear function is always linear with respect to some field. The field is implicit, somewhat, in the definition but always present. Linear functions are sometimes called *operators*.

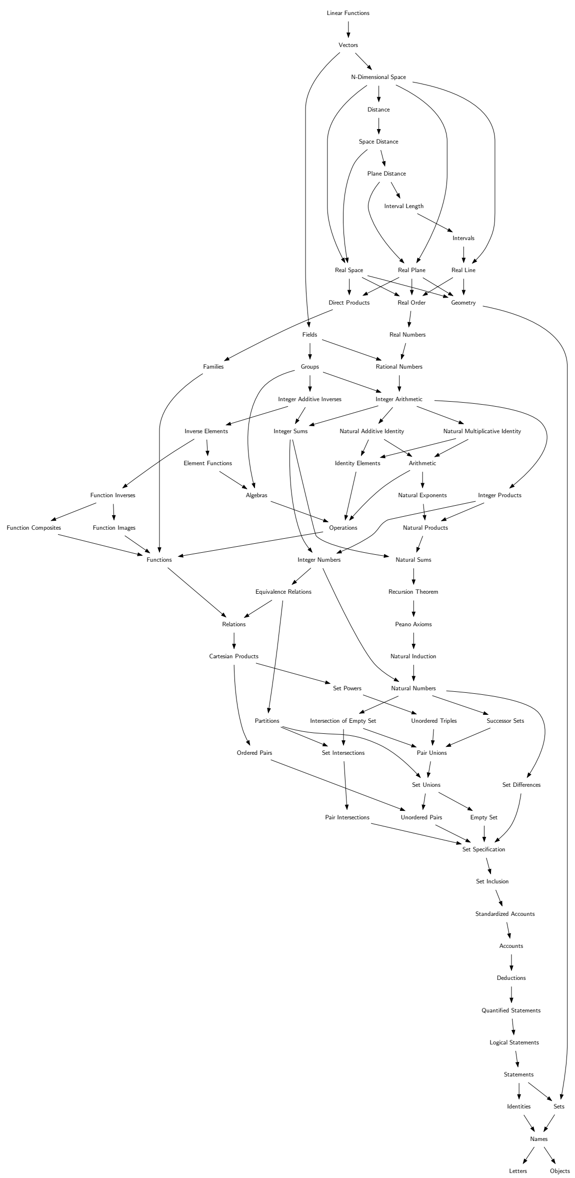
## Notation

Let $(V_1, F)$ and $(V_2, F)$ be two vector spaces over the same field $F$. Let $f : V_1 \to V_2$. $f$ is linear if

$$f(au + bv) = af(u) + bf(v)$$

for all $a, b \in F$ and $u, v \in V_1$.

[1]Future editions will expand on this why. In particular, the intuition of proportionality.


Linear Functions
Vectors
N-Dimensional Space
Distance
Space Distance
Plane Distance
Interval Length
Intervals
Real Space
Real Plane
Real Line
Direct Products
Real Order
Geometry
Fields
Real Numbers
Families
Groups
Rational Numbers
Integer Additive Inverses
Integer Arithmetic
Inverse Elements
Integer Sums
Natural Additive Identity
Natural Multiplicative Identity
Element Functions
Identity Elements
Arithmetic
Function Inverses
Algebras
Natural Exponents
Integer Products
Function Composites
Function Images
Operations
Natural Products
Functions
Integer Numbers
Natural Sums
Equivalence Relations
Recursion Theorem
Relations
Peano Axioms
Cartesian Products
Natural Induction
Set Powers
Natural Numbers
Partitions
Intersection of Empty Set
Unordered Triples
Successor Sets
Ordered Pairs
Set Intersections
Pair Unions
Set Unions
Set Differences
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects