Why

[1]

Definition

Proposition 1. *Let W be a positive semidefinite n by n matrix. Then $g : \mathbf{R}^n \to \mathbf{R}$ defined by $g(x) = \sqrt{x^\top W x}$ is a norm on $\mathbf{R}^n$.*

Notation

Let $W \in \mathbf{R}^{n \times n}$, positive semidefinite. Then we denote the norm corresponding to W by $\|\cdot\|_W$. So then, the norm of a vector $x \in \mathbf{R}^n$ is $\|x\|_w$. Notice that $\|x\|_W = \|W^{1/2}x\|_2$.

Visualization

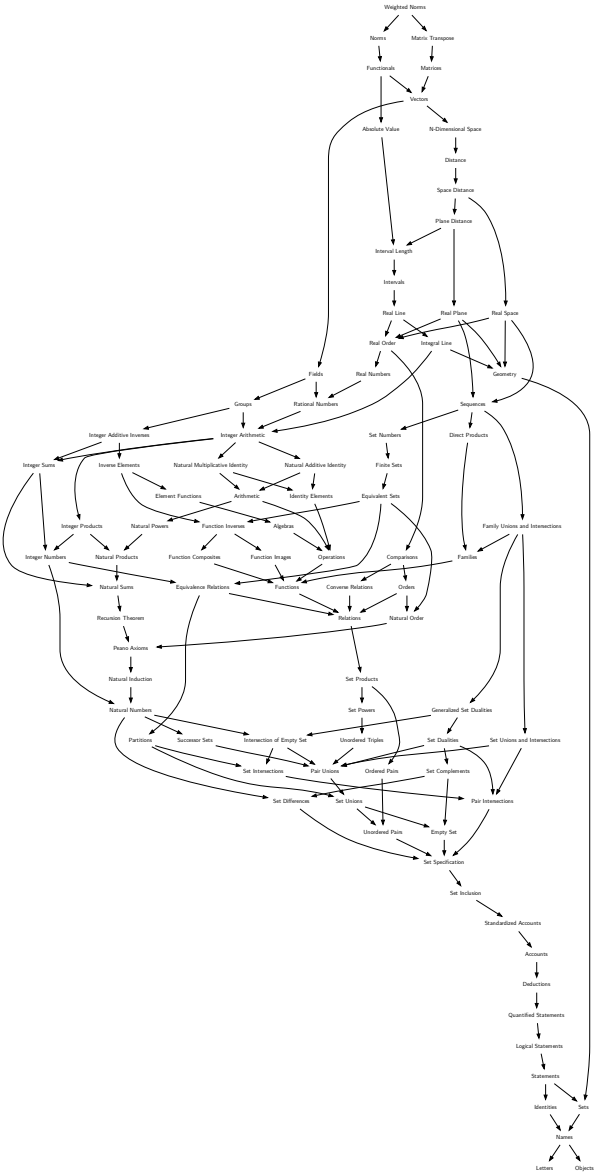
[2]

We can compare the Euclidean norm on $\mathbf{R}^2$ with the weighted norm given by

$$W = \begin{pmatrix} 2 & 1 \\ 1 & 4 \end{pmatrix}$$

[1] Future editions will include this.

[2] Future editions will visualize these norms as function on $\mathbf{R}^2$, via contour plots.


Weighted Norms
Norms
Matric Transpose
Functionals
Matrices
Vectors
Absolute Value
N-Dimensional Space
Distance
Space Distance
Plane Distance
Interval Length
Intervals
Real Line
Real Plane
Real Space
Real Order
Integral Line
Fields
Real Numbers
Geometry
Groups
Rational Numbers
Sequences
Integer Additive Inverses
Integer Arithmetic
Set Numbers
Direct Products
Integer Sums
Inverse Elements
Natural Multiplicative Identity
Natural Additive Identity
Finite Sets
Element Functions
Arithmetic
Identity Elements
Equivalent Sets
Integer Products
Natural Powers
Function Inverses
Algebras
Family Unions and Intersections
Integer Numbers
Natural Products
Function Composites
Function Images
Operations
Comparisons
Families
Natural Sums
Equivalence Relations
Functions
Converse Relations
Orders
Recursion Theorem
Relations
Natural Order
Peano Axioms
Natural Induction
Set Products
Natural Numbers
Set Powers
Generalized Set Dualities
Partitions
Successor Sets
Intersection of Empty Set
Unordered Triples
Set Dualities
Set Unions and Intersections
Set Intersections
Pair Unions
Ordered Pairs
Set Complements
Set Differences
Set Unions
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects