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

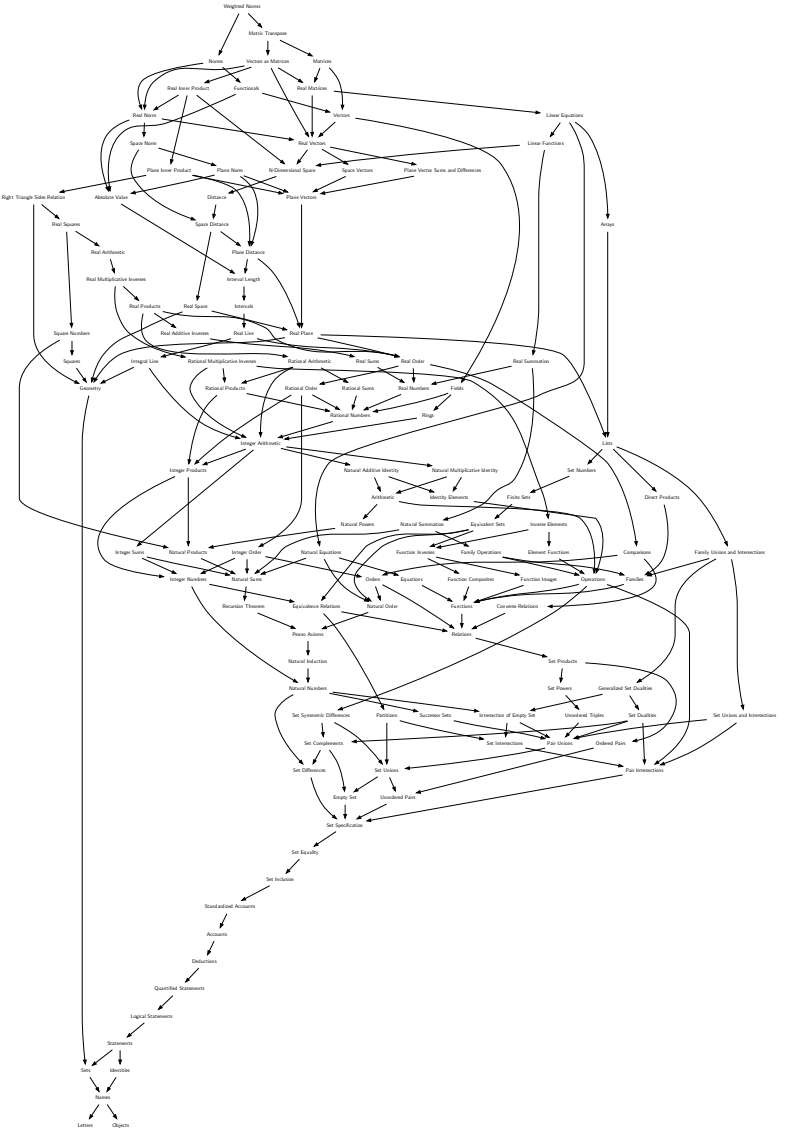
[2]

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