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

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

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[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

Matrices Functionals

Vectors

N-Dimensional Space Absolute Value

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 Inverse Integer Arithmetic

Inverse Elements Integer Sums Natural Multiplicative Identity Natural Additive Identity

Element Functions Identity Elements Arithmetic

Function Inverses Algebras Natural Exponents Integer Products

Function Images Function Composites 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 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