Matrix-Vector Products

Why

TODO

Definition

The *matrix-vector product* between an $m \times n$-matrix and an n-vector is the result of the linear combination of the columns of the matrix with the sequence of scalars in the vector. So the matrix-vector product is an m-vector.

Notation

Let C be a nonempty set. Let $A \in C^{m \times n}$ and let $x \in C^n$. We denote the matrix-vector product of A with x by Ax, read "A x".

If we denote Ax by b, then

$$b_i = \sum_{j=1}^{n} a_{ij} x_j$$

for $i \in \{1, 2, \ldots, m\}$. Let

$$A = \begin{bmatrix} a_1^T \\ a_2^T \\ \vdots \\ a_m^T \end{bmatrix}$$

Or, if a_i^T is the ith row of A, then

$$b_i = a_i^T x$$

for $i \in \{1, 2, \ldots, m\}$.

Matrix-Vector Products

Matrices Linear Combinations

Vectors Numberings

N-Dimensional Space Finite Sets

Distance

Space Distance

Plane Distance

Real Space Real Plane Interval Length Real Line

Direct Products Geometry Intervals

Families Real Order

Real Numbers Fields

Rational Numbers

Groups

Integer Arithmetic Integer Additive Inverses

Natural Additive Identity Natural Multiplicative Identity Inverse Elements Integer Sums

Identity Elements Element Functions Arithmetic

Algebras Function Inverses Natural Exponents Integer Products Equivalent Sets

Operations Function Composite Function Images Natural Products Integer Numbers

Functions Natural Sums Equivalence Relations

Relations Recursion Theorem Natural Order

Peano Axioms

Cartesian Products Natural Induction

Set Powers Natural Numbers

Unordered Triples Successor Sets Intersection of Empty Set Partitions

Ordered Pairs Pair Unions Set Intersections

Set Differences Set Unions

Unordered Pairs Empty Set Pair Intersections

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Sets Identities

Names

Letters Objects