Definition

Let $A \in \mathbf{R}^{l \times m}$ and $B \in \mathbf{R}^{m \times n}$. In this case we call A and B *conformable*. The *matrix-matrix product* of A and B is the matrix $C \in \mathbf{R}^{l \times n}$ whose ith row c_i (for $i = 1, \ldots, n$) is defind $c_i = Ab_i$ where b_i is the ith row of B.

Notation

We denote the matrix product of A and B by AB.

Properties

Future editions will contain accounts of the following basic properties.

Proposition 1. *Matrix multiplication is associative.*

Proposition 2. *Matrix multiplication is not commutative.*

Indeed, the matrix-matrix produce of B and A may not even be defined, if B and A are not conformable.

Real Matrix-Matrix Products

Real Matrix-Vector Products

Real Linear Combinations — Vectors as Matrices

Real Matrices — Real Inner Product — Real Norm

Linear Equation

Linear Function — Real Vectors — Space Norm

Plane Inner Product — Plane Vector Sums and Differences — Space Vector — N-Dimensional Space — Plane Norm

Right Triangle Sides Relation — Plane Vectors — Distance — Absolute Value

Real Square — Space Distance

Real Arithmetic — Plane Distance

Real Multiplication Inverses — Interval Length

Real Products — Real Addition Inverses — Square Numbers — Real Space — Interval

Real Summation — Rational Arithmetic — Real Sums — Rational Multiplication Inverses — Real Order — Square — Integral Line

Rational Products — Rational Sums — Real Numbers — Rational Order — Geometry

Rational Numbers

Integer Arithmetic

Arrays

Lists — Integer Products — Natural Addition Identity — Natural Multiplication Identity

Set Numbers

Finite Sets — Direct Products

Natural Summation — Arithmetic — Identity Elements — Inverse Elements

Equivalent Sets

Family Unions and Intersections — Natural Equation — Family Operation — Function Inverses — Integer Sums — Natural Products — Integer Order — Element Functions — Comparisons

Equations — Families — Function Image — Function Composites — Natural Sums — Integer Numbers — Orders — Operations

Equivalence Relations — Natural Order — Functions — Recursion Theorem — Common Relations

Peano Axiom — Relations

Natural Induction — Set Products

Generalized Set Dualities — Natural Numbers — Set Powers

Set Unions and Intersections — Partitions — Intersection of Empty Set — Set Dualities — Successor Sets — Unordered Triples — Set Symmetric Differences

Set Intersections — Set Complements — Ordered Pairs

Pair Intersection — Pair Unions — Set Unions — Set Differences — Unordered Pairs

Empty Set

Set Specification

Set Equality

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities — Sets

Nouns

Letters — Objects