Definition

The *range* of a matrix $A \in \mathbf{R}^{m \times n}$ is the set

$$\{y \in \mathbf{R}^m \mid (\exists z \in \mathbf{R}^n)(y = Az)\}.$$

We often denote this set by $\{Az \mid z \in \mathbf{R}^n\}$. It is a subset of $\mathbf{R}^m$, the output space.

The *nullspace* of a matrix $A \in \mathbf{R}^{m \times n}$ is the set

$$\{z \in \mathbf{R}^n \mid Az = 0\}.$$

It is a subset of $\mathbf{R}^n$, the input space.


Range and Null Space
Real Matrices
Linear Equations
Arrays
Real Vectors
Linear Functions
Space Vectors
Plane Vector Sums and Differences
N-Dimensional Space
Plane Vectors
Distance
Space Distance
Plane Distance
Interval Length
Real Space
Intervals
Real Plane
Real Line
Integral Line
Real Summation
Real Order
Geometry
Natural Summation
Real Numbers
Rational Order
Rational Numbers
Lists
Set Numbers
Direct Products
Integer Arithmetic
Natural Fractions
Finite Sets
Natural Additive Identity
Natural Multiplicative Identity
Integer Products
Equivalent Sets
Identity Elements
Natural Arithmetic
Family Unions and Intersections
Function Inverses
Family Operations
Comparisons
Integer Order
Integer Sums
Natural Powers
Natural Equations
Function Composites
Function Images
Families
Operations
Orders
Integer Numbers
Natural Products
Equations
Equivalence Relations
Functions
Converse Relations
Natural Order
Natural Sums
Relations
Recursion Theorem
Ordered Pair Projections
Peano Axioms
Set Products
Natural Induction
Generalized Set Dualities
Set Powers
Natural Numbers
Set Unions and Intersections
Partitions
Set Dualities
Intersection of Empty Set
Unordered Triples
Successor Sets
Set Symmetric Differences
Ordered Pairs
Set Intersections
Pair Unions
Set Complements
Pair Intersections
Set Unions
Set Differences
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects