Why

It happens that all circulant matrices have the same eigenvectors.

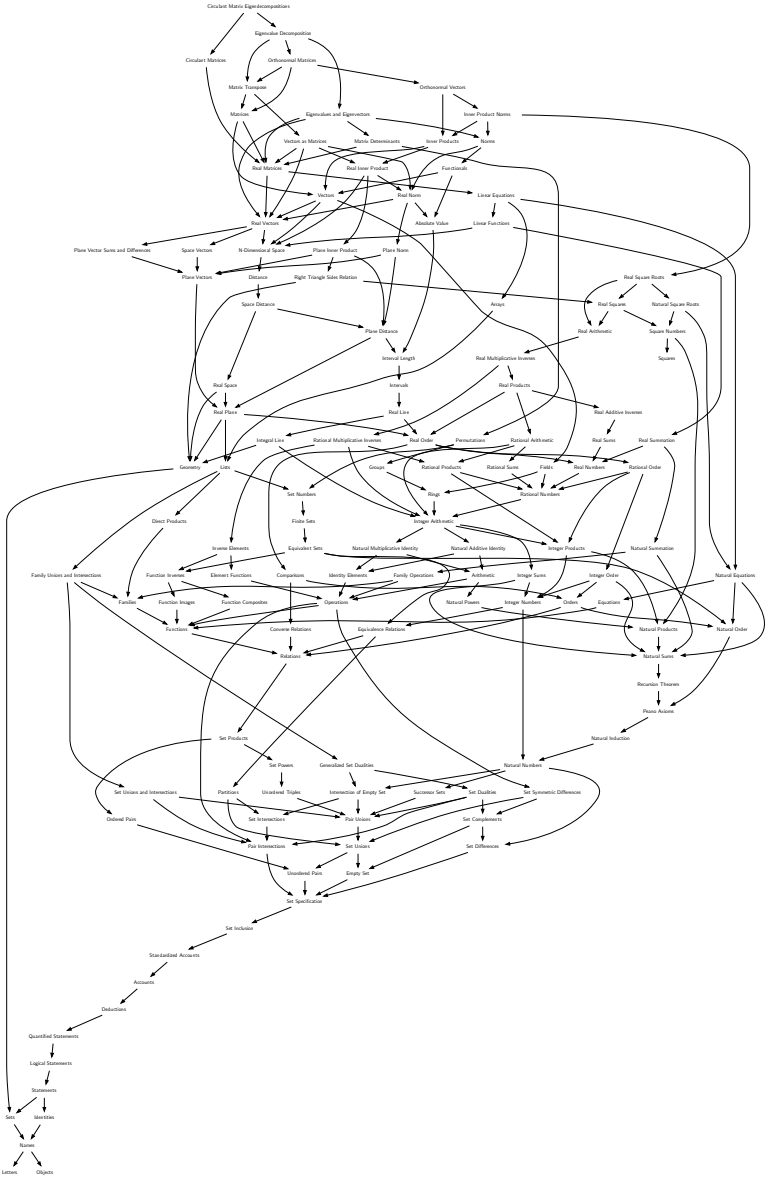
Definition

Recall that C is circulant then

$$C = c_0 I + c_1 S + c_2 S^2 + \cdots + c_{n-1} S^{n-1}.$$

So $q \in \mathbf{R}^d$ is an eigenvector of C if and only if it is one of S.[1]

[1] Future editions will complete this development.


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