Why

It happens that all circulant matrices have the same eigenvectors.

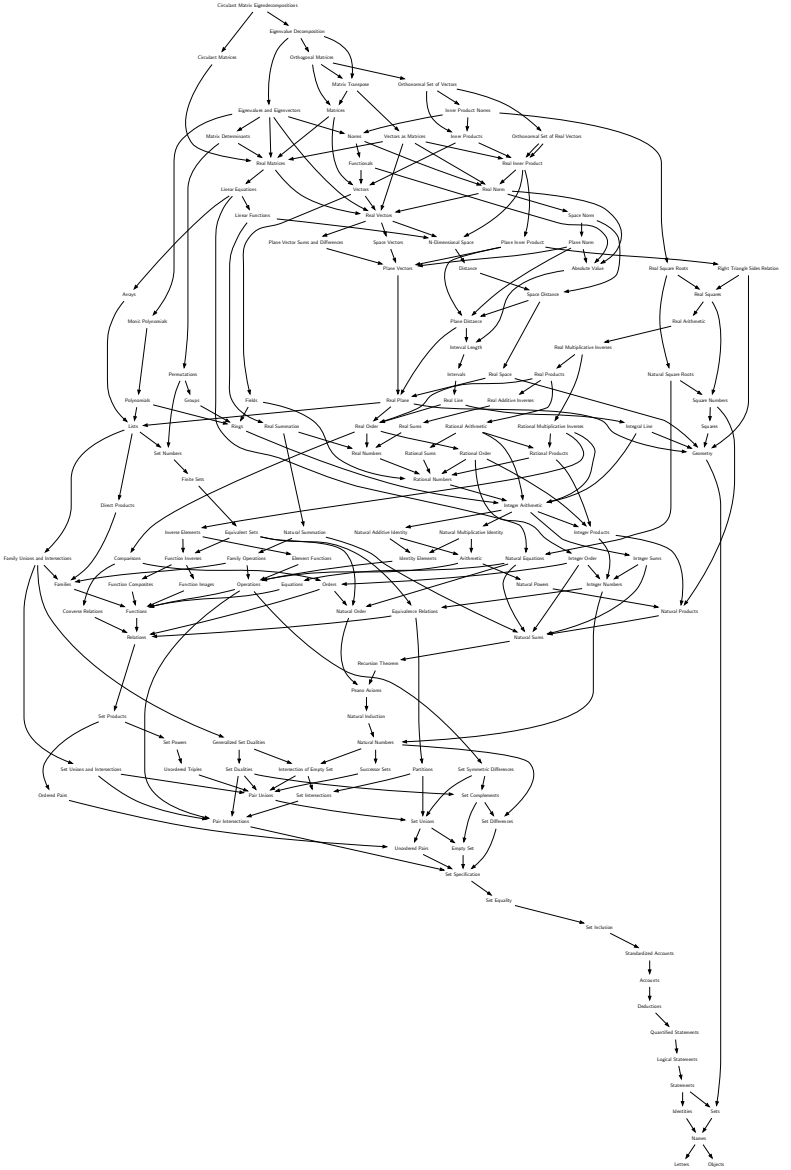
Definition

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