SCILAB: LINEAR ALGEBRA QUICK REFERENCE

MATRIX AND VECTOR COMPONENTS

`A = [1 2; 3 4]`	Matrix definition
`A(i,j)`	Entry in row i, column j
`A(i,:)`	Row i as vector
`A(:,j)`	Column j as vector
`diag(A)`	Diagonal entries as vector
`A(r_1:r_2,c_1:c_2)`	Submatrix
`tril(A)`	Lower triangular part of matrix
`triu(A)`	Upper triangular part of matrix
`v = [1 2 3]`	Row vector definition
`v = [1; 2; 3]`	Column vector definition
`v(i)`	ith entry in v

MATRIX AND VECTOR OPERATIONS

`A'`	Transpose
`A+B`	Sum of matrices
`A*B`	Product of matrices
`A.*B`	Component-wise product of matrices
`A.*.B`	Kronecker product of matrices
`A**n`	Matrix power A^n
`sum(v.*w)`	Dot product of v and w
`cross(v,w)`	Cross product of v and w

SPECIAL MATRICES

`eye(n,n)`	$n \times n$ identity matrix
`zeros(m,n)`	$m \times n$ zero matrix
`ones(m,n)`	$m \times n$ matrix with all entries 1
`rand(m,n)`	$m \times n$ random matrix
`diag([1,2,3])`	Diagonal matrix
`linspace(s,e,i)`	Vector beginning at s, ending at e, with i equally distant entries

MATRIX PROPERTIES

`rref(A)`	Reduced echelon form of A
`det(A)`	Determinant of A
`inv(A)`	Inverse of A
`sqrtm(A)`	Square root of A
`trace(A)`	Trace of A
`rank(A)`	Rank of A
`kernel(A)`	Kernel (nullspace) of A
`spec(A)`	Eigenvalues of A
`[a b] = spec(A)`	a is matrix of eigenvectors, b is diagonal matrix of eigenvalues
`size(A)`	Dimensions of matrix as vector
`issquare(A)`	Returns true if A is square matrix
`max(A)`	Greatest entry in A
`min(A)`	Least entry in A
`svd(A)`	Singular values of A
`orth(A)`	Orthogonal basis of A
`coffg(A)`	Cofactors of A

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Vector Properties

`norm(v)`	Vector length of v (magnitude)
`length(v)`	Dimension of v (number of entries)
`sum(v)`	Sum of entries in v
`prod(v)`	Product of entries in v
`max(v)`	Greatest entry in v
`min(v)`	Least entry in v

Elementary Row Operations

`A([i j],:)= A([j i],:)`	Interchange row i and j
`A(i,:)= c*A(i,:)`	Multiply row i by c
`A(i,:)= A(i,:)+c*A(j,:)`	Add c times row j to row i

Components of Numbers

`int(x)`	Integer part of x
`round(x)`	Round x to nearest integer
`floor(x)`	$\lfloor x \rfloor$, greatest integer less or equal to x
`ceil(x)`	$\lceil x \rceil$, smallest integer greater or equal to x
`sign(x)`	Sign; 1 if $x > 0$, -1 if $x < 0$, 0 if $x = 0$
`complex(a,b)`	Define complex number $a + bi$
`conj(x)`	Complex conjugate of x
`real(x)`	Real part of complex number x
`imag(x)`	Imaginary part of complex number x
`fix(A)`	Matrix A with all entries rounded down

Polynomials

`poly([1 2 3],'x','c')`	Polynomial $3x^2 + 2x + 1$
`poly([1 2 3],'x','r')`	Polynomial in x with roots $1, 2, 3$
`poly(spec(A),'x','r')`	Characteristic polynomial of A
`roots(p)`	Roots of polynomial p

Matrix Decomposition

`[L U] = lu(A)`	U upper triangular, $A = LU$
`[L U E] = lu(A)`	U upper triangular, L lower triangular, E permutation matrix, $EA = LU$
`[Q R] = qr(A)`	Q orthogonal, R upper triangular, $A = QR$
`[Q R E] = qr(A)`	Q orthogonal, R upper triangular, E permutation matrix, $AE = QR$
`[U S V] = svd(A)`	S diagonal, U, V unitary, $A = USV^T$

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