

matrix — Matrix functions

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[M-5] Manual entry Function

Purpose

Characteristics

trace()	trace()	trace of matrix
det()	det() dettriangular()	determinant determinant of triangular matrix
norm()	norm()	matrix and vector norms
cond()	cond()	matrix condition number
rank()	rank()	rank of matrix

Cholesky decomposition, solvers, & inverters

cholesky()	cholesky()	Cholesky square-root decomposition $A = GG'$
cholsolve()	cholsolve()	solve $AX = B$ for X
cholinv()	cholinv()	inverse of pos. def. symmetric matrix
invsym()	invsym()	real symmetric matrix inversion

LU decomposition, solvers, & inverters

lud()	lud()	LU decomposition $A = PLU$
lusolve()	lusolve()	solve $AX = B$ for X
luinv()	luinv()	inverse of square matrix

QR decomposition, solvers, & inverters

qrd()	qrd() qrdp() hqrd() hqrdp() hqrdmultq() hqrdmultq1t() hqrdq() hqrdq1() hqrdr() hqrdr1()	QR decomposition $A = QR$ QR decomposition $A = QRP'$ QR decomposition $A = f(H)R_1$ QR decomposition $A = f(H, \tau)R_1P'$ return QX or $Q'X$, $Q = f(H, \tau)$ return Q'_1X , $Q_1 = f(H, \tau)$ return $Q = f(H, \tau)$ return $Q_1 = f(H, \tau)$ return R return R_1
qrsolve()	qrsolve()	solve $AX = B$ for X
qrinv()	qrinv()	generalized inverse of matrix

Hessenberg decomposition & generalized Hessenberg decomposition

hessenbergd()	hessenbergd()	Hessenberg decomposition $T = Q'XQ$
ghessenbergd()	ghessenbergd()	gen. Hessenberg decomp. $T = Q'XQ$

Schur decomposition & generalized Schur decomposition

schurd()	schurd() schurdgroupby()	Schur decomposition $T = U'AV$; $R = U'BA$ Schur decomp. with grouping of results
gschurd()	gschurd() gschurdgroupby()	gen. Schur decomposition $T = U'AV$; $R = U'BA$ gen. Schur decomp. with grouping of results

Singular value decomposition, solvers, & inverters

svd()	svd() svdsv()	singular value decomposition $A = UDV'$ singular values s
fullsvd()	fullsvd() fullsdiag()	singular value decomposition $A = USV'$ convert s to S
svsolve()	svsolve()	solve $AX = B$ for X
pinv()	pinv()	Moore–Penrose pseudoinverse

 Triangular solvers

solverlower()	<code>solverlower()</code>	solve $AX = B$ for X , A lower triangular
	<code>solveupper()</code>	solve $AX = B$ for X , A upper triangular

 Eigensystems, powers, & transcendental

eigensystem()	<code>eigensystem()</code>	right eigenvectors and eigenvalues
	<code>eigenvalues()</code>	eigenvalues
	<code>lefteigensystem()</code>	left eigenvectors and eigenvalues
	<code>symeigensystem()</code>	eigenvectors/eigenvalues of symmetric matrix
	<code>symeigenvalues()</code>	eigenvalues of symmetric matrix

eigensystemselect()	<code>eigensystemselect*()</code>	selected eigenvectors/eigenvalues etc.
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geigensystem()	<code>geigensystem()</code>	generalized eigenvectors/eigenvalues etc.
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matpowersym()	<code>matpowersym()</code>	powers of symmetric matrix
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matexpsym()	<code>matexpsym()</code>	exponentiation of symmetric matrix
	<code>matlogsym()</code>	logarithm of symmetric matrix

 Equilibration

_equilrc()	<code>_equilrc()</code>	row/column equilibration
	<code>_equilr()</code>	row equilibration
	<code>_equilc()</code>	column equilibration
	<code>_perhapsequilrc()</code>	row/column equilibration if necessary
	<code>_perhapsequilr()</code>	row equilibration if necessary
	<code>_perhapsequilc()</code>	column equilibration if necessary
	<code>rowscalefactors()</code>	row-scaling factors for equilibration
	<code>colscalefactors()</code>	column-scaling factors for equilibration

 LAPACK

lapack()	<code>LA_*</code>	LAPACK linear-algebra functions
	<code>_flopfin()</code>	convert matrix order from row major to column major
	<code>_flopout()</code>	convert matrix order from column major to row major

Description

The above functions are what most people would call mathematical matrix functions.

Remarks and examples

For other mathematical functions, see

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| [M-4] scalar | Scalar mathematical functions |
| [M-4] mathematical | Important mathematical functions |

Also see

[\[M-4\] intro](#) — Index and guide to functions