

There are many MATLAB features which cannot be included in these introductory notes. Listed below are some of the MATLAB functions and operators available, grouped by subject area. Use the on-line help facility.

There are many functions beyond these. There exist, in particular, several "toolboxes" of functions for specific areas; included among such are signal processing, control systems, robust-control, system identification, optimization, splines, chemometrics, mu-analysis and synthesis, state-space identification, and neural networks. (The toolboxes, which are optional, may not be installed on your system.) These can be explored via the command help.

General

help	help facility
demo	run demonstrations
who	list variables in memory
what	list M-files on disk
size	row and column dimensions
length	vector length
clear	clear workspace
computer	type of computer
^C	local abort
exit	exit MATLAB
quit	same as exit

Matrix/Array Operators

Matrix Operators		Array Operators	
+	addition	+	addition
-	subtraction	-	subtraction
*	multiplication	*	multiplication
/	right division	/	right division
\	left division	\	left division
^	power	^	power
'	conjugate transpose	'	transpose

Relational and Logical Operators

<	less than
<=	less than or equal
>	greater than
>=	greater than or equal
==	equal
~=	not equal
&	and
 	or
~	not

,	separate subscripts and function arguments
;	end rows, suppress printing
%	comments
:	subscripting, vector generation
!	execute operating system command

Special Characters

=	assignment statement
[used to form vectors and matrices
]	see [
(arithmetic expression precedence
)	see (
.	decimal point
...	continue statement to next line

Special Values

ans	answer when expression not assigned
eps	floating point precision
pi	pi
i, j	sqrt(-1)
inf	infinity
NaN	Not-a-Number
clock	wall clock
date	date
flops	floating point operation count
nargin	number of function input arguments
nargout	number of function output arguments

Disk Files

chdir	change current directory
delete	delete file
diary	diary of the session
dir	directory of files on disk
load	load variables from file
save	save variables to file
type	list function or file
what	show M-files on disk
fprintf	write to a file
pack	compact memory via save

Special Matrices

compan	companion
diag	diagonal
eye	identity
gallery	esoteric
hadamard	Hadamard
hankel	Hankel
hilb	Hilbert
invhilb	inverse Hilbert
linspace	linearly spaced vectors
logspace	logarithmically spaced vectors
magic	magic square
meshdom	domain for mesh points
ones	constant
pascal	Pascal
rand	random elements
toeplitz	Toeplitz
vander	Vandermonde
zeros	zero

Matrix Manipulation

rot90	rotation
fliplr	flip matrix left-to-right
flipud	flip matrix up-to-down
diag	diagonal matrices
tril	lower triangular part
triu	upper triangular part
reshape	reshape
.'	transpose
:	convert matrix to single column; A(:)

Relational and Logical Functions

any	logical conditions
all	logical conditions
find	find array indices of logical values
isnan	detect NaNs
finite	detect infinities

isempty	detect empty matrices
isstr	detect string variables
strcmp	compare string variables

Control Flow

if	conditionally execute statements
elseif	used with if
else	used with if
end	terminate if , for , while
for	repeat statements a number of times
while	do while
break	break out of for and while loops
return	return from functions
pause	pause until key pressed

Programming and M-files

input	get numbers from keyboard
keyboard	call keyboard as M-file
error	display error message
function	define function
eval	interpret text in variables
feval	evaluate function given by string
echo	enable command echoing
exist	check if variables exist
casesen	set case sensitivity
global	define global variables
startup	startup M-file
getenv	get environment string
menu	select item from menu
etime	elapsed time

Text and Strings

abs	convert string to ASCII values
eval	evaluate text macro
num2str	convert number to string
int2str	convert integer to string
setstr	set flag indicating matrix is a string
sprintf	convert number to string
isstr	detect string variables
strcmp	compare string variables
hex2num	convert hex string to number

Command Window

clc	clear command screen
home	move cursor home
format	set output display format
disp	display matrix or text
fprintf	print formatted number
echo	enable command echoing

Graphing

plot	linear X-Y plot
plot3	linear 3-D plot
loglog	loglog X-Y plot
semilogx	semi-log X-Y plot
semilogy	semi-log X-Y plot
polar	polar plot
mesh	3-dimensional mesh surface
contour	contour plot
meshdom	domain for mesh plots
bar	bar charts
stairs	stairstep graph
errorbar	add error bars
ezplot	easy to use function plotter
ezcontour	easy to use contour plotter
ezmesh	easy to use 3-D mesh
ezpolar	easy to use polar coordinate plotter
ezsurf	easy to use combo surface/contour
plotter	
ezsurf	easy to use 3-D colored surface plotter

Graph Annotation

title	plot title
xlabel	x-axis label
ylabel	y-axis label
grid	draw grid lines
text	arbitrarily position text
gtext	mouse-positioned text
ginput	graphics input

Graph Window Control

axis	manual axis scaling
hold	hold plot on screen
shg	show graph window
clg	clear graph window
subplot	split graph window

Elementary Math Functions

abs	absolute value or complex magnitude
angle	phase angle
sqrt	square root
real	real part
imag	imaginary part
conj	complex conjugate
round	round to nearest integer
fix	round toward zero
floor	round toward -infinity
ceil	round toward infinity
sign	signum function

rem	remainder
exp	exponential base e
log	natural logarithm
log10	log base 10

Trigonometric Functions – Angle in RADIANS

sin	sine
cos	cosine
tan	tangent
asin	arcsine
acos	arccosine
atan	arctangent
atan2	four quadrant arctangent
sinh	hyperbolic sine
cosh	hyperbolic cosine
tanh	hyperbolic tangent
asinh	hyperbolic arcsine
acosh	hyperbolic arccosine
atanh	hyperbolic arctangent

Trigonometric Functions – Angle in DEGREES

sind	sine
cosd	cosine
tand	tangent
asind	arcsine
acosd	arccosine
atand	arctangent
atan2d	four quadrant arctangent

Special Functions

bessel	bessel function
gamma	gamma function
rat	rational approximation
erf	error function
inverf	inverse error function
ellipk	complete elliptic integral of first kind
ellipj	Jacobian elliptic integral

Decompositions and Factorizations

balance	balanced form
backsub	backsubstitution
cdf2rdf	convert complex-diagl to real-diag
chol	Cholesky factorization
eig	eigenvalues and eigenvectors
hess	Hessenberg form
inv	inverse
lu	factors from Gaussian elimination
nls	nonnegative least squares
null	null space
orth	orthogonalization
pinv	pseudoinverse
qr	orthogonal-triangular decomposition
qz	QZ algorithm
rref	reduced row echelon form
schur	Schur decomposition
svd	singular value decomposition

Matrix Conditioning

cond	condition number in 2-norm
norm	1-norm,2-norm,F-norm, infinity-norm
rank	rank
rcond	condition estimate (reciprocal)

Elementary Matrix Functions

expm	matrix exponential
logm	matrix logarithm
sqrtm	matrix square root
funm	arbitrary matrix function
poly	characteristic polynomial
det	determinant
trace	trace
kron	Kronecker tensor product

Polynomials

poly	characteristic polynomial
roots	polynomial roots-companion matrix
roots1	polynomial roots---Laguerre's method
polyval	polynomial evaluation
polyvalm	matrix polynomial evaluation
conv	multiplication
deconv	division
residue	partial-fraction expansion
polyfit	polynomial curve fitting

Column-wise Data Analysis

max	maximum value
min	minimum value
mean	mean value

median	median value
std	standard deviation
sort	sorting
sum	sum of elements
prod	product of elements
cumsum	cumulative sum of elements
cumprod	cumulative product of elements
diff	approximate derivatives
hist	histograms
corrcoef	correlation coefficients
cov	covariance matrix
cplxpair	reorder into complex pairs

Signal Processing

abs	complex magnitude
angle	phase angle
conv	convolution
corrcoef	correlation coefficients
cov	covariance
deconv	deconvolution
fft	radix-2 fast Fourier transform
fft2	two-dimensional FFT
ifft	inverse fast Fourier transform
ifft2	inverse 2-D FFT
fftshift	FFT rearrangement

Numerical Integration

quad	Numerically evaluate integral, adaptive Simpson quadrature
quadl	Numerically evaluate integral, adaptive Lobatto quadrature

Differential Equation Solution

ode23	2nd/3rd order Runge-Kutta method
ode45	4th/5th order Runge-Kutta-Fehlberg method

Nonlinear Equations and Optimization

fmin	minimum of a function of one variable
fmins	minimum of a multivariable function
fsolve	solution of a system of nonlinear equations (zeros of a multivariable function)
fzero	zero of a function of one variable

Interpolation

spline	cubic spline
interp1	1-D data interpolation table look-up
interp2	2-D data interpolation table look-up
interp3	3-D data interpolation table look-up