APPENDIX B

Command and Function Quick Reference

This appendix is not exhaustive; it lists most of the MATLAB commands and functions used in the text, as well as a few more.

For a complete list by category (with links to detailed descriptions) see the online documentation **MATLAB: Reference: MATLAB Function Reference: Functions by Category**.

The command `help` by itself displays a list of all the function categories (each in its own directory):

```
matlab\general       -  General purpose commands.
matlab\ops           -  Operators and special characters.
matlab\lang          -  Programming language constructs.
matlab\elmat         -  Elementary matrices and matrix manipulation.
matlab\elfun         -  Elementary math functions.
matlab\specfun       -  Specialized math functions.
matlab\matfun        -  Matrix functions - numerical linear algebra.
matlab\datafun       -  Data analysis and Fourier transforms.
matlab\audio         -  Audio support.
matlab\polyfun       -  Interpolation and polynomials.
matlab\funfun        -  Function functions and ODE solvers.
matlab\sparfun       -  Sparse matrices.
matlab\graph2d       -  Two dimensional graphs.
matlab\graph3d       -  Three dimensional graphs.
matlab\specgraph     -  Specialized graphs.
matlab\graphics      -  Handle Graphics.
matlab\uitools       -  Graphical user interface tools.
matlab\strfun        -  Character strings.
matlab\iofun         -  File input/output.
matlab\timefun       -  Time and dates.
matlab\datatypes     -  Data types and structures.
matlab\verctrl       -  Version control.
matlab\winfun        -  Windows Operating System Interface Files.
(DDE/ActiveX)
matlab\demos         -  Examples and demonstrations.
```

B.1 GENERAL PURPOSE COMMANDS

B.1.1 Managing commands

`demo`	Run demos
`help`	Online help
`helpwin`	Display categories of functions with links to each category
`lookfor`	Keyword search through `help` entries
`type`	List M-file
`what`	Directory listing of M- and MAT-files
`which`	Locate functions and files

B.1.2 Managing variables and the workspace

`clear`	Clear variables and functions from memory
`disp`	Display matrix or text
`length`	Length of a vector
`load`	Retrieve variables from disk
`save`	Save workspace variables to disk
`size`	Array dimensions
`who, whos`	List variables in the workspace

B.1.3 Files and the operating system

`beep`	Produce a beep sound
`cd`	Change current working directory
`delete`	Delete file
`diary`	Save text of MATLAB session
`dir`	Directory listing
`edit`	Edit an M-file
`!`	Execute operating system command

B.1.4 Controlling the Command Window

`clc`	Clear Command Window
`echo`	Echo commands in script
`format`	Set output format for `disp`
`home`	Send cursor home
`more`	Control paged output

B.1.5 Starting and quitting MATLAB

`exit`	Terminate MATLAB
`quit`	Terminate MATLAB
`startup`	M-file executed when MATLAB starts

B.2 LOGICAL FUNCTIONS

`all`	True if all elements of vector are true (non-zero)
`any`	True if any element of vector is true
`exist`	Check if variable or file exists
`find`	Find indices of non-zero elements
`is*`	Detect various states
`logical`	Convert numeric values to logical

B.3 LANGUAGE CONSTRUCTS AND DEBUGGING

B.3.1 MATLAB as a programming language

`error`	Display error message
`eval`	Interpret string containing MATLAB expression
`feval`	Function evaluation
`for`	Repeat statements a specific number of times
`global`	Define global variable
`if`	Conditionally execute statements
`persistent`	Define persistent variable
`switch`	Switch among several cases
`try`	Begin `try` block
`while`	Repeat statements conditionally

B.3.2 Interactive input

`input`	Prompt user for input
`keyboard`	Invoke keyboard as a script file
`menu`	Generate menu of choices for user input
`pause`	Wait for user response

B.4 MATRICES AND MATRIX MANIPULATION

B.4.1 Elementary matrices

`eye`	Identity matrix
`linspace`	Vector with linearly spaced elements
`ones`	Matrix of ones
`rand`	Uniformly distributed random numbers and arrays
`randn`	Normally distributed random numbers and arrays
`zeros`	Matrix of zeros
`: (colon)`	Vector with regularly spaced elements

B.4.2 Special variables and constants

`ans`	Most recent answer
`eps`	Floating point relative accuracy
`i or j`	$\sqrt{-1}$
`Inf`	Infinity
`NaN`	Not-a-Number
`nargin, nargout`	Number of actual function arguments
`pi`	3.14159 26535 897 …
`realmax`	Largest positive floating point number
`realmin`	Smallest positive floating point number
`varargin, varargout`	Pass or return variable numbers of arguments

B.4.3 Time and date

`calendar`	Calendar
`clock`	Wall clock (complete date and time)
`date`	You'd never guess
`etime`	Elapsed time
`tic, toc`	Stopwatch
`weekday`	Day of the week

B.4.4 Matrix manipulation

`cat`	Concatenate arrays
`diag`	Create or extract diagonal
`fliplr`	Flip in left/right direction
`flipud`	Flip in up/down direction
`repmat`	Replicate and tile an array
`reshape`	Change shape
`rot90`	Rotate 90°
`tril`	Extract lower tridiagonal part
`triu`	Extract upper tridiagonal part

B.4.5 Specialized matrices

`gallery`	Test matrices
`hilb`	Hilbert matrix
`magic`	Magic square
`pascal`	Pascal matrix
`wilkinson`	Wilkinson's eigenvalue test matrix

B.5 MATHEMATICAL FUNCTIONS

`abs`	Absolute value
`acos, acosh`	Inverse cosine and inverse hyperbolic cosine
`acot, acoth`	Inverse cotangent and inverse hyperbolic cotangent
`acsc, acsch`	Inverse cosecant and inverse hyperbolic cosecant
`angle`	Phase angle
`asec, asech`	Inverse secant and inverse hyperbolic secant
`asin, asinh`	Inverse sine and inverse hyperbolic sine
`atan, atanh`	Inverse tangent (two quadrant) and inverse hyperbolic tangent
`atan2`	Inverse tangent (four quadrant)
`bessel`	Bessel function
`ceil`	Round up
`conj`	Complex conjugate
`cos, cosh`	Cosine and hyperbolic cosine
`cot, coth`	Cotangent and hyperbolic cotangent
`csc, csch`	Cosecant and hyperbolic cosecant
`erf`	Error function
`exp`	Exponential
`fix`	Round toward zero
`floor`	Round down
`gamma`	Gamma function
`imag`	Imaginary part
`log`	Natural logarithm
`log2`	Dissect floating point numbers into exponent and mantissa
`log10`	Common logarithm
`mod`	Modulus (signed remainder after division)
`rat`	Rational approximation
`real`	Real part
`rem`	Remainder after division
`round`	Round toward nearest integer
`sec, sech`	Secant and hyperbolic secant
`sign`	Signum function
`sin, sinh`	Sine and hyperbolic sine
`sqrt`	Square root
`tan, tanh`	Tangent and hyperbolic tangent

B.6 MATRIX FUNCTIONS

`det`	Determinant
`eig`	Eigenvalues and eigenvectors
`expm`	Matrix exponential

`inv`	Matrix inverse
`poly`	Characteristic polynomial
`rank`	Number of linearly independent rows or columnsw
`rcond`	Condition estimator
`trace`	Sum of diagonal elements
`{}\ and/`	Linear equation solution

B.7 DATA ANALYSIS

`cumprod`	Cumulative product
`cumsum`	Cumulative sum
`diff`	Difference function
`fft`	One-dimensional fast Fourier transform
`max`	Largest element
`mean`	Average value of elements
`median`	Median value of elements
`min`	Smallest element
`prod`	Product of elements
`sort`	Sort into ascending order
`std`	Standard deviation
`sum`	Sum of elements
`trapz`	Trapezoidal rule for numerical integration

B.8 POLYNOMIAL FUNCTIONS

`polyfit`	Fit polynomial to data
`polyval`	Evaluate polynomial
`roots`	Find polynomial roots

B.9 FUNCTION FUNCTIONS

`bvp4c`	Solve two-point boundary value problems for ODEs
`fmin`	Minimize function of one variable
`fmins`	Minimize function of several variables
`fzero`	Find zero of function of one variable
`ode23, ode23s, ode45`	Solve initial value problems for ODEs
`quad`	Numerical integration

B.10 SPARSE MATRIX FUNCTIONS

`full`	Convert sparse matrix to full matrix
`sparse`	Construct sparse matrix from non-zeros and subscripts
`spy`	Visualize sparse matrix

B.11 CHARACTER STRING FUNCTIONS

`char`	Characters from ASCII codes
`double`	ASCII codes of characters
`lower`	Convert string to lower case
`sprintf`	Write formatted data to a string
`str2mat`	String to matrix conversion
`strcat`	String concatenation
`strcmp`	Compare strings
`upper`	Convert string to upper case

B.12 FILE I/O FUNCTIONS

`fclose`	Close one or more open files
`feof`	Test for end-of-file
`fopen`	Open file or obtain information about open files
`fprintf`	Write formatted data to file
`fread`	Read binary data from file
`fscanf`	Read formatted data from file
`fseek`	Set file position indicator
`ftell`	Get file position indicator
`fwrite`	Write binary data to file

B.13 GRAPHICS

B.13.1 2-D

`bar`	Bar graph
`grid`	Grid lines
`hist`	Histogram plot
`loglog`	Log-log scale plot
`plot`	Linear plot
`polar`	Polar co-ordinate plot
`semilogx`	Semi-log scale plot
`semilogy`	Semi-log scale plot
`text`	Text annotation
`title`	Graph title
`xlabel`	*x*-axis label
`ylabel`	*y*-axis label
`zoom`	Zoom in and out on a 2-D plot

B.13.2 3-D

`clabel`	Contour plot elevation labels
`comet3`	Animated 3-D plot
`contour`	Contour plot in 2-D
`contour3`	Contour plot in 3-D
`mesh`	3-D mesh surface
`meshc`	3-D mesh surface with contour plot
`meshgrid`	*x* and *y* arrays for 3-D plots
`plot3`	Line plot in 3-D
`quiver`	Quiver plot.
`surf`	Shaded surface
`surfl`	Shaded surface with lighting
`view`	Rotation of 3-D figure
`zlabel`	*z*-axis label.

B.13.3 General

`axes`	Create axes object
`axis`	Control axis scaling and appearance
`cla`	Clear axes
`clf`	Clear current figure
`colorbar`	Display color bar (color scale)
`colormap`	Set the color look-up table (list of color maps)
`drawnow`	Complete any pending drawing
`figure`	Create figure (graph) windows
`fplot`	Plot a function
`gca`	Get current axes handle
`gcf`	Get current figure handle
`gco`	Return handle of current graphics object
`get`	Get graphics object properties
`ginput`	Graphical input from a mouse or cursor
`gtext`	Mouse placement of text
`set`	Set graphics object properties
`subplot`	Create axes in tiled positions