

Appendix:

Summary of Characters, Commands, and Functions

The following tables list MATLAB's characters, commands, and functions that are covered in the book. The items are grouped by subjects.

Characters and arithmetic operators

Character	Description	Page
+	Addition.	11, 64
–	Subtraction.	11, 64
*	Scalar and array multiplication.	11, 65
. *	Element-by-element multiplication of arrays.	72
/	Right division.	11, 71
\	Left division.	11, 70
./	Element-by-element right division.	72
.\	Element-by-element left division.	72
^	Exponentiation.	11
.^	Element-by-element exponentiation.	72
:	Colon; creates vectors with equally spaced elements, represents range of elements in arrays.	37, 44
=	Assignment operator.	16
()	Parentheses; sets precedence, encloses input arguments in functions and subscripts of arrays.	11, 42, 44, 224
[]	Brackets; forms arrays. encloses output arguments in functions.	37, 38, 39, 224
,	Comma; separates array subscripts and function arguments, separates commands in the same line.	9, 17, 42-45, 224
;	Semicolon; suppresses display, ends row in array.	10, 39
'	Single quote; matrix transpose, creates string.	41, 53-55
...	Ellipsis; continuation of line.	10
%	Percent; denotes a comment, specifies output format.	10

Relational and logical operators

Character	Description	Page
<	Less than.	176
>	Greater than.	176
<=	Less than or equal.	176

Relational and logical operators (Continued)

Character	Description	Page
>=	Greater than or equal.	176
==	Equal.	176
~=	Not equal.	176
&	Logical AND.	179
	Logical OR.	179
~	Logical NOT.	179

Managing commands

Command	Description	Page
cd	Changes current directory.	24
clc	Clears the Command Window.	10
clear	Removes all variables from the memory.	19
clear x y z	Removes variables x, y, and z from the memory.	19
close	Closes the active Figure Window.	158
fclose	Closes a file.	109
figure	Opens a Figure Window.	158
fopen	Opens a file.	108
global	Declares global variables.	227
help	Displays help for MATLAB functions.	226
iskeyword	Displays keywords.	19
lookfor	Search for specified word in all help entries.	226
who	Displays variables currently in the memory.	20, 96
whos	Displays information on variables in the memory.	20, 96

Predefined variables

Variable	Description	Page
ans	Value of last expression.	19
eps	The smallest difference between two numbers.	19
i	$\sqrt{-1}$	19
inf	Infinity.	19
j	Same as i.	19
NaN	Not a number.	19
pi	The number π .	19

Display formats in the Command Window

Command	Description	Page
format bank	Two decimal digits.	13
format compact	Eliminates empty lines.	13

Display formats in the Command Window (Continued)

Command	Description	Page
<code>format long</code>	Fixed-point format with 14 decimal digits.	13
<code>format long e</code>	Scientific notation with 15 decimal digits.	13
<code>format long g</code>	Best of 15-digit fixed or floating point.	13
<code>format loose</code>	Adds empty lines.	13
<code>format short</code>	Fixed-point format with 4 decimal digits.	13
<code>format short e</code>	Scientific notation with 4 decimal digits.	13
<code>format short g</code>	Best of 5-digit fixed or floating point.	13

Elementary math functions

Function	Description	Page
<code>abs</code>	Absolute value.	15
<code>exp</code>	Exponential.	14
<code>factorial</code>	The factorial function.	15
<code>log</code>	Natural logarithm.	15
<code>log10</code>	Base 10 logarithm.	15
<code>nthroot</code>	Real nth root or a real number.	14
<code>sqrt</code>	Square root.	14

Trigonometric math functions

Function	Description	Page	Function	Description	Page
<code>acos</code>	Inverse cosine.	15	<code>cos</code>	Cosine.	15
<code>acot</code>	Inverse cotangent.	15	<code>cot</code>	Cotangent.	15
<code>asin</code>	Inverse sine.	15	<code>sin</code>	Sine.	15
<code>atan</code>	Inverse tangent.	15	<code>tan</code>	Tangent.	15

Hyperbolic math functions

Function	Description	Page	Function	Description	Page
<code>cosh</code>	Hyperbolic cosine.	15	<code>sinh</code>	Hyperbolic sine.	15
<code>coth</code>	Hyperbolic cotangent.	15	<code>tanh</code>	Hyperbolic tangent.	15

Rounding

Function	Description	Page
<code>ceil</code>	Round towards infinity.	16
<code>fix</code>	Round towards zero.	16
<code>floor</code>	Round towards minus infinity.	16
<code>rem</code>	Returns the remainder after x is divided by y .	16
<code>round</code>	Round to the nearest integer.	15
<code>sign</code>	Signum function.	16

Creating arrays

Function	Description	Page
diag	Creates a diagonal matrix from a vector. Creates a vector from the diagonal of a matrix.	50
eye	Creates a unit matrix.	40, 68
linspace	Creates equally spaced vector.	38
ones	Creates an array with ones.	40
rand	Creates an array with random numbers.	77, 78
randi	Creates an array with random integers.	78, 79
randn	Creates an array with normally distributed numbers.	79
randperm	Creates vector with permutation of integers.	78
zeros	Creates an array with zeros.	40

Handling arrays

Function	Description	Page
length	Number of elements in the vector.	49
reshape	Rearrange a matrix.	49
size	Size of an array.	49

Array functions

Function	Description	Page
cross	Calculates cross product of two vectors.	77
det	Calculates determinant.	70, 77
dot	Calculates scalar product of two vectors.	66, 77
inv	Calculates the inverse of a square matrix.	69, 77
max	Returns maximum value.	76
mean	Calculates mean value.	76
median	Calculates median value.	76
min	Returns minimum value.	76
sort	Arranges elements in ascending order.	76
std	Calculates standard deviation.	77
sum	Calculates sum of elements.	76

Input and output

Command	Description	Page
disp	Displays output.	101
fprintf	Displays or saves output.	103-110
input	Prompts for user input.	99
load	Retrieves variables to the workspace.	112
save	Saves the variables in the workspace.	111
uiimport	Starts the Import Wizard	116

Input and output

Command	Description	Page
xlsread	Imports data from Excel	114
xlswrite	Exports data to Excel	115

Two-dimensional plotting

Command	Description	Page
bar	Creates a vertical bar plot.	152
barh	Creates a horizontal bar plot.	152
errorbar	Creates a plot with error bars.	151
fplot	Plots a function.	140
hist	Creates a histogram.	153-156
hold off	Ends hold on.	142
hold on	Keeps current graph open.	142
line	Adds curves to existing plot.	143
loglog	Creates a plot with log scale on both axes.	149
pie	Creates a pie plot.	153
plot	Creates a plot.	134
polar	Creates a polar plot.	156
semilogx	Creates a plot with log scale on the x axis.	149
semilogy	Creates a plot with log scale on the y axis.	149
stairs	Creates a stairs plot.	152
stem	Creates a stem plot.	153

Three-dimensional plotting

Command	Description	Page
bar3	Creates a vertical 3-D bar plot.	331
contour	Creates a 2-D contour plot.	330
contour3	Creates a 3-D contour plot.	330
cylinder	Plots a cylinder.	331
mesh	Creates a mesh plot.	327, 328
meshc	Creates a mesh and a contour plot.	329
meshgrid	Creates a grid for a 3-D plot.	325
meshz	Creates a mesh plot with a curtain.	329
pie3	Creates a pie plot.	332
plot3	Creates a plot.	323
pol2cart	Convert the polar coordinates grid to a grid in Cartesian coordinates.	333
scatter3	Creates a scatter plot.	332
sphere	Plots a sphere.	331

Three-dimensional plotting (Continued)

Command	Description	Page
stem3	Creates a stem plot	332
surf	Creates a surface plot.	327, 329
surfc	Creates a surface and a contour plot.	329
surfl	Creates a surface plot with lighting.	330
waterfall	Creates a mesh plot with a waterfall effect.	330

Formatting plots

Command	Description	Page
axis	Sets limits to axes.	147
colormap	Sets color.	328
grid	Adds grid to a plot.	148, 328
gtext	Adds text to a plot.	145
legend	Adds legend to a plot.	145
subplot	Creates multiple plots on one page.	157
text	Adds text to a plot.	145
title	Adds title to a plot.	144
view	Controls the viewing direction of a 3-D plot.	333
xlabel	Adds label to x axis.	144
ylabel	Adds label to y axis.	144

Math functions (create, evaluate, solve)

Command	Description	Page
feval	Evaluates the value of a math function.	238
fminbnd	Determines the minimum of a function.	298
fzero	Solves an equation with one variable.	296

Numerical integration

Function	Description	Page
quad	Integrates a function.	300
quadl	Integrates a function.	301
trapz	Integrates a function.	302

Ordinary differential equation solvers

Command	Description	Page
ode113	Solves a first order ODE.	304
ode15s	Solves a first order ODE.	305
ode23	Solves a first order ODE.	304
ode23s	Solves a first order ODE.	305

Ordinary differential equation solvers (Continued)

Command	Description	Page
ode23t	Solves a first order ODE.	305
ode23tb	Solves a first order ODE.	305
ode45	Solves a first order ODE.	304

Logical Functions

Function	Description	Page
all	Determines if all array elements are nonzero.	182
and	Logical AND.	181
any	Determines if any array elements are nonzero.	182
find	Finds indices of certain elements of a vector.	182
not	Logical NOT.	181
or	Logical OR.	181
xor	Logical exclusive OR.	182

Flow control commands

Command	Description	Page
break	Terminates execution of a loop.	202
case	Conditionally execute commands.	189
continue	Terminates a pass in a loop.	202
else	Conditionally execute commands.	186
elseif	Conditionally execute commands.	187
end	Terminates conditional statements and loops.	184, 189, 193, 197
for	Repeats execution of a group of commands.	193
if	Conditionally execute commands.	184
otherwise	Conditionally execute commands.	189
switch	Switches among several cases based on expression.	189
while	Repeats execution of a group of commands.	197

Polynomial functions

Function	Description	Page
conv	Multiplies polynomials.	265
deconv	Divides polynomials.	265
poly	Determines coefficients of a polynomial.	264
polyder	Determines the derivative of a polynomial.	266
polyval	Calculates the value of a polynomial.	262
roots	Determines the roots of a polynomial.	263

Curve fitting and interpolation

Function	Description	Page
<code>interp1</code>	One-dimensional interpolation.	276
<code>polyfit</code>	Curve fit polynomial to set of points.	269

Symbolic Math

Function	Description	Page
<code>collect</code>	Collects terms in an expression.	354
<code>diff</code>	Differentiates an equation.	362
<code>double</code>	Converts number from symbolic form to numerical form	352
<code>dsolve</code>	Solves an ordinary differential equation.	365
<code>expand</code>	Expands an expression.	355
<code>ezplot</code>	Plots an expression.	368
<code>factor</code>	Factors to product of lower order polynomials.	355
<code>findsym</code>	Displays the symbolic variables in an expression.	353
<code>int</code>	integrates an expression.	363
<code>pretty</code>	Displays expression in math format.	356
<code>simplify</code>	Simplifies an expression.	356
<code>solve</code>	Solves a single equation, or a system of equations.	357
<code>subs</code>	Substitutes numbers in an expression.	371
<code>sym</code>	Creates symbolic object.	348
<code>syms</code>	Creates symbolic object.	350