APPENDIX I

MATLAB® Functions (Not Including Those Listed in the "Explore Other Interesting Features" Sections)

abs	absolute value
all	true if all elements in the input argument are true
angle	angle of a complex number
any	true if any element in the input argument is true
area	filled two-dimensional area plot
asin	arcsine in radians
asind	arcsine in degrees
asinh	inverse hyperbolic sine in radians
audioplayer	creates an audioplayer object
audiorecorder	creates an audiorecorder object
axis	sets limits on axes for a plot
bar	two-dimensional bar chart
bar3	three-dimensional bar chart
bar3h	three-dimensional horizontal bar chart
barh	two-dimensional horizontal bar chart
blanks	creates a character vector of all blank spaces
cast	casts a variable to a specified type
categorical	converts cell array to categorical array
categories	lists categories from a categorical array
ceil	rounds toward infinity
cell	creates a cell array
celldisp	displays contents of a cell array
cellplot	displays contents of a cell array in boxes
cellstr	converts from a character matrix to a cell array of character vectors
char	creates a character matrix
checkcode	displays Code Analyzer results for code files
class	returns the type or class of the input argument
clear	clears variable(s) and functions from the workspace
clearvars	clears variable(s) from the workspace

clf	clears the figure window
clock	stores the current date and time in a vector
collect	collects like terms in a symbolic math expression
colorbar	displays a color scale in a plot
colormap	returns the current colormap, or sets a matrix to be the current colormap
comet	animated two-dimensional plot
comet3	three-dimensional animated plot
complex	creates a complex number
conj	complex conjugate
connector	connects mobile device to MATLAB
contains	returns true if a substring is found in text
count	counts the number of occurrences of a substring in text
cross	cross product
cummax	cumulative, or running, maximum of a vector or columns of a matrix
cummin	cumulative, or running, minimum of a vector or columns of a matrix
cumprod	cumulative, or running, product of a vector or columns of a matrix
cumsum	cumulative, or running, sum of a vector or columns of a matrix
cylinder	returns three-dimensional data vectors to create a cylinder
date	stores the current date as a string
dbcont	continue executing code in debug mode
dbquit	quit debug mode
dbstep	step through code in debug mode
dbstop	set a breakpoint in debug mode
deblank	gets rid of trailing blanks in text
deg2rad	converts from degrees to radians
demo	shows MATLAB Examples in the Help Browser
det	finds the determinant of a matrix
diag	returns the diagonal of a matrix, or creates a diagonal matrix
diff	finds differences between consecutive elements; used to approximate derivatives
disp	simple display (output)
doc	brings up a documentation page
dot	dot product
double	converts to the type double
echo	toggle; displays all statements as they are executed
end	ends control statements and functions; refers to last element

endsWith	returns true if a string ends with a substring
erase	removes occurrences of a substring in text
error	displays an error message
eval	evaluates a string as a function or command
exit	quits out of MATLAB
exp	exponential function
expand	expands a symbolic math expression
eye	creates an identity matrix
ezplot	simple plot function that plots a function without need for data vectors
factor	factors a symbolic math expression
factorial	factorial of an integer *n*, is 1*2*3*…**n*
false	equivalent to logical(0); creates an array of false values
fclose	closes an open file
feof	true if the specified file is at the end-of-file
feval	evaluates a function handle on a string as a function call
fgetl	low-level input function reads one line from a file as a character vector
fgets	same as fgetl but does not remove newline characters
fieldnames	returns the names of fields in a structure as a cell array of character vectors
figure	create or refer to Figure Windows
find	returns indices of an array for which a logical expression is true
fix	rounds toward zero
flip	flips an array, either left to right or up to down
fliplr	flips columns of a matrix from left to right
flipud	flips rows of a matrix up to down
floor	rounds toward negative infinity
fopen	low-level file function; opens a file for a specified operation
format	many options for formatting displays
fplot	plots a function passed as a function handle
fprintf	formatted display (output); writes either to a file or to the screen (the default)
fscanf	low-level file input function; reads from a file into a matrix
func2str	converts from a function handle to a character vector
fzero	attempts to find a zero of a function, given the function handle
gca	handle to the current axes
gcf	handle to the current figure
get	gets properties of a plot object

getaudiodata	gets amplitude from an audiorecorder object
getframe	gets a movie frame, which is a snapshot of the current plot
ginput	gets graphical coordinates from a mouse click
grid	plot toggle; turns grid lines on or off
gtext	allows the user to place a string on a plot in location of a mouse click
help	displays help information for built-in or user-defined functions, or scripts
histogram	plot function: plots a histogram
hold	plot toggle; freezes plot in Figure Window so the next will be superimposed
i	constant for the square root of negative one
im2double	converts an image matrix to type double
imag	imaginary part of a complex number
image	displays an image matrix
imread	reads in an image matrix
imshow	displays an image
imwrite	writes a matrix in an image format
inf	constant for infinity
input	prompts the user and reads user's input
int	symbolic math integration
int16	converts a number to a 16-bit signed integer
int2str	converts from an integer to a string storing the integer
int32	converts a number to a 32-bit signed integer
int64	converts a number to a 64-bit signed integer
int8	converts a number to an 8-bit signed integer
intersect	set intersection
intmax	largest value possible in a specified integer type
intmin	smallest value possible in a specified integer type
inv	inverse of a matrix
isa	true if the input argument is the specified class
isbanded	true if the input matrix is banded
iscellstr	true if the input argument is a cell array storing only character vectors
ischar	true if the input argument is a string, or character vector
isdiag	true if the input matrix is a diagonal matrix
isempty	true if the input argument is an empty vector or empty string
isequal	true if two array arguments are equal element-by-element
isfield	true if a string is the name of a field within a structure
iskeyword	true if the string input argument is the name of a keyword
isletter	true if the input argument is a letter of the alphabet

ismember	set function receives two sets; true for every member of first set also in second
isreal	true if input argument is a real number (not complex)
issorted	true if the input vector is sorted in ascending order
issortedrows	true if the rows in a matrix are sorted
isspace	true if the input argument is a white space character
isstring	true if the input argument is a string array
isStringScalar	true if the input argument is a string scalar
isstrprop	true if the string argument is a specified property
isstruct	true if the input argument is a structure
issymmetric	true if the input matrix is symmetric
istril	true if the input matrix is lower triangular
istriu	true if the input matrix is upper triangular
j	constant for the square root of negative one
jet	returns all or part of the 64 colors in the jet colormap
join	appends strings in string arrays together
legend	displays a legend on a plot
length	length, or number of elements, in a vector; largest dimension for a matrix
limit	computes limit of a symbolic math expression
line	graphics primitive object that creates a line
linspace	creates a vector of linearly spaced values
load	inputs a file into a matrix, or reads variables from a .mat file (the default)
log	natural logarithm
log10	base 10 logarithm
log2	base 2 logarithm
logical	converts numbers to the type logical
loglog	plot function that uses logarithmic scales for x and y axes
logspace	creates a vector of logarithmically spaced values
lookfor	looks for a string in the H1 comment line in files
lower	converts letters to lower-case in a string
listdlg	creates a dialog box that allows the user to make a choice
max	the maximum value in a vector, or for every column in a matrix
maxk	the maximum k values in a vector, or for every column in a matrix
mean	the mean (average) of values in a vector, or every column in a matrix
median	the median (middle) value in a sorted vector, or for every column in a matrix

menu	displays a menu of push buttons and returns number of choice (not recommended)
mesh	three-dimensional mesh surface plot
meshgrid	creates x and y vectors to be used in images or as function arguments
methods	displays methods of a class
min	the minimum value in a vector, or for every column in a matrix
mink	the minimum k values in a vector, or for every column in a matrix
mobiledev	creates an object to enable reading sensor data from a mobile device
mod	modulus after division
mode	the maximum value in a vector, or for every column in a matrix
movegui	moves a Figure Window within the screen
movie	plays a movie, or sequence of screen shots
namelengthmax	the maximum length of identifier names
NaN	mathematics constant for "Not a Number"
nargin	number of input arguments passed to a function
nargout	number of output arguments expected to be returned by a function
newline	returns a newline character
nthroot	nth root of a number
num2str	converts a real number to a string containing the number
numden	symbolic math function, separates the numerator and denominator of a fraction
numel	total number of elements in a vector or matrix
ones	creates a matrix of all ones
parula	returns all or part of the 64 colors in the parula colormap
patch	graphics primitive object that creates a filled-in two-dimensional polygon
pi	constant for π
pie	creates a two-dimensional pie chart
pie3	creates a three-dimensional pie chart
pink	returns all or part of the 64 colors in the pink colormap
play	plays an audio signal
plot	simple plot function, plots 2D points; markers, color, etc. can be specified
plot3	simple three-dimensional plot function, plots three-dimensional points
plus	the functional form of the addition operator; also concatenates strings

polarplot	plot function for complex numbers, plots the magnitude and angle
poly2sym	converts a vector of coefficients of a polynomial to a symbolic expression
polyder	derivative of a polynomial
polyfit	fits a polynomial curve of a specified degree to data points
polyint	integral of a polynomial
polyval	evaluates a polynomial at specified value(s)
pretty	displays a symbolic expression using exponents
print	prints or saves a figure or image
prod	the product of all values in a vector, or of every column in a matrix
profile	toggle; the Profiler generates reports on execution time of code
properties	displays properties of a class
quad	integration using Simpson's method
quit	quits MATLAB
rad2deg	converts from radians to degrees
rand	generates uniformly distributed random real number(s) in the open interval (0,1)
randi	generates random integer(s) in the specified range
randn	generates normally distributed random real numbers
real	real part of a complex number
recordblocking	records audio from a microphone
rectangle	graphics primitive to create a rectangle; curvature can vary
rem	remainder after division
repelem	replicates elements in a matrix; creates $m \times n$ copies of each
repmat	replicates a matrix; creates $m \times n$ copies of the matrix
reshape	changes dimensions of a matrix to any matrix with the same number of elements
rgb2gray	converts an RGB image matrix to grayscale
rmfield	remove a field from a structure
rng	random number generator, sets the seed for random functions and gets the state
roots	roots of a polynomial equation
rot90	rotates a matrix 90 degrees counter-clockwise
round	rounds a real number toward the nearest integer
rref	puts an augmented matrix in reduced row echelon form
save	writes a matrix to a file or saves variables to a .mat file
semilogx	plot function, uses a scale for logarithmic x and a linear scale for y

semilogy	plot function, uses a linear scale for x and a logarithmic scale for y
set	sets properties of a plot object
setdiff	set function, returns elements that are in one vector, but not in another
setxor	set exclusive or, returns the elements that are not in the intersection of two sets
sign	signum, returns −1, 0, or 1
simplify	simplifies a symbolic math expression
sin	sine in radians
sind	sine in degrees
single	converts a number to the type single
sinh	hyperbolic sine in radians
size	returns the dimensions of a matrix
solve	symbolic math function to solve an equation or simultaneous equations
sort	sorts the elements of a vector (default is ascending order)
sortrows	sorts the rows of a matrix; for strings results in an alphabetical sort
sound	sends a sound signal (vector of amplitudes) to an output device
sphere	returns three-dimensional data vectors to create a sphere
spiral	creates a square matrix of integers spiraling from 1 in the middle
sprintf	creates a formatted string
sqrt	square root
startsWith	true if input string starts with a substring
std	standard deviation
stem	two-dimensional stem plot
stem3	three-dimensional stem plot
str2double	converts from a string containing a number to a double number
str2func	converts a string to a function handle
str2num	converts from a string containing number(s) to a number array
strcat	horizontal string concatenation
strcmp	string compare, used instead of equality operator for strings
strcmpi	string compare, ignoring case
strfind	find a substring within a longer string
string	creates a string
strings	preallocates a string array

strip	removes leading and trailing whitespace characters from text
strjoin	concatenates strings in a cell array into a long string
strlength	determines the length of a string
strncmp	string compare the first *n* characters of strings
strncmpi	string compare the first *n* characters, ignoring case
strrep	replace all occurrences of one substring with another within a longer string
strsplit	splits a string into elements in a cell array
strtok	breaks one longer string into two shorter strings, with all characters retained
strtrim	deletes both leading and trailing blanks from a string
struct	create a structure by passing pairs of field names and values
subplot	creates a matrix of plots in the Figure Window
subs	substitutes a value into a symbolic math expression
sum	the sum of the values in a vector or of every column in a matrix
summary	shows variables and statistics for a table
surf	three-dimensional surface plot
sym	creates a symbolic variable or expression
sym2poly	converts a symbolic expression to a vector of coefficients for a polynomial
syms	creates multiple symbolic variables
table	creates a table data structure
text	graphics primitive object to put a string on a plot
textscan	file input function, reads from a file into a cell array of column vectors
tic / toc	used to time code
timeit	times a function execution
title	writes a string as a title on a plot
trace	the trace (sum of values on the diagonal) of a matrix
trapz	trapezoidal rule to approximate the area under a curve
tril	converts a matrix to a lower triangular matrix
triu	converts a matrix to an upper triangular matrix
true	equivalent to logical(1), creates a matrix of all true values
type	display the contents of a file in the Command Window
uibuttongroup	groups together button objects
uicontrol	basic function to create graphical user interface objects of different styles
uint16	converts a number to a 16-bit unsigned integer
uint32	converts a number to a 32-bit unsigned integer

uint64	converts a number to a 64-bit unsigned integer
uint8	converts a number to an 8-bit unsigned integer
uipanel	groups together graphical user interface objects
union	set function, the union of two sets
unique	returns all of the unique values within a set (vector)
upper	converts all letters to upper-case
var	variance
varargin	built-in cell array to store input arguments
varargout	built-in cell array to store output arguments
who	displays variables in the base workspace
whos	displays more information on the variables in the base workspace
xlabel	puts text as a label on the *x* axis of a plot
xlsread	reads from a spreadsheet with filename.xls
xlswrite	writes to a spreadsheet with filename.xls
xticklabels	specifies labels for the tick marks on the *x* axis of a plot
xor	exclusive or, true if only one argument is true
ylabel	puts text as a label on the *y* axis of a plot
zeros	creates a matrix of all zero values
zlabel	puts text as a label on the *z* axis of a three-dimensional plot