

Table 2.2 Predefined Special Values

Function	Purpose
pi	Contains π to 15 significant digits
i, j	Contain the value $i(\sqrt{-1})$.
Inf	This symbol represents machine infinity. It is usually generated as a result of a division by 0.
NaN	The symbol stands for Not-a-Number. It is the result of an undefined mathematical operation, such as the division of zero by zero.
clock	This special variable contains the current date and time in the form of a 6-element row vector containing the year, month, day, hour, minute, and second.
date	Contains the current data in a character strings format, such as 24-Nov-1998.
eps	This variable name is short for “epsilon”. It is the smallest difference between two numbers that can be represented on the computer.
ans	A special variable used to store the result of an expression if that result is not explicitly assigned to some other variable.

Special Symbols

[]	Array constructor
()	Forms subscripts
' '	Marks the limits of a character string
,	Comma, separates subscripts or matrix elements
;	1. Suppresses echoing in command window 2. Separates matrix rows 3. Separates assignment statements on a line
%	Marks the beginning of a comment
:	Colon operator, used to create shorthand lists
+	Array and matrix addition
-	Array and matrix subtraction
.*	Array multiplication
*	Matrix multiplication
./	Array right division
\	Array left division
/	Matrix right division
\	Matrix left division
.^	Array exponentiation
'	Transpose operator

Table 2.6 Common Array and Matrix Operations

Operation	MATLAB Form	Comments
Array Addition	$a + b$	Array addition and matrix addition are identical.
Array Subtraction	$a - b$	Array subtraction and matrix subtraction are identical.
Array Multiplication	$a .* b$	Element-by-element multiplication of a and b . Both arrays must be the same shape, or one of them must be a scalar.
Matrix Multiplication	$a * b$	Matrix multiplication of a and b . The number of columns in a must equal the number of rows in b .
Array Right Division	$a ./ b$	Element-by-element division of a and b : $a(i, j) / b(i, j)$. Both arrays must be the same shape, or one of them must be a scalar.
Array Left Division	$a .\ b$	Element-by-element division of a and b , but with b in the numerator: $b(i, j) / a(i, j)$. Both arrays must be the same shape, or one of them must be a scalar.
Matrix Right Division	a / b	Matrix division defined by $a * \text{inv}(b)$, where $\text{inv}(b)$ is the inverse of matrix b .
Matrix Left Division	$a \backslash b$	Matrix division defined by $\text{inv}(a) * b$, where $\text{inv}(a)$ is the inverse of matrix a .
Array Exponentiation	$a .^ b$	Element-by-element exponentiation of a and b : $a(i, j) ^ b(i, j)$. Both arrays must be the same shape, or one of them must be a scalar.

Table 2.8 Common MATLAB Functions

Function	Description
Mathematical Functions	
<code>abs(x)</code>	Calculates $ x $.
<code>acos(x)</code>	Calculates $\cos^{-1}x$.
<code>angle(x)</code>	Returns the phase angle of the complex value x , in radians.
<code>asin(x)</code>	Calculates $\sin^{-1}x$.
<code>atan(x)</code>	Calculates $\tan^{-1}x$.
<code>atan2(y,x)</code>	Calculates $\tan^{-1} \frac{y}{x}$ over all four quadrants of the circle (results in <i>radians</i> in the range $-\pi \leq \tan^{-1} \frac{y}{x} \leq \pi$).
<code>cos(x)</code>	Calculates $\cos x$, with x in radians.
<code>exp(x)</code>	Calculate e^x .
<code>log(x)</code>	Calculates the natural logarithm $\log_e x$
<code>[value,index] = max(x)</code>	Returns the maximum value in vector x , and optionally the location of that value.
<code>[value,index] = min(x)</code>	Returns the minimum value in vector x , and optionally the location of that value.
<code>mod(x,y)</code>	Remainder or modulo function.
<code>sin(x)</code>	Calculates $\sin x$, with x in radians
<code>sqrt(x)</code>	Calculates the square root of x .
<code>tan(x)</code>	Calculates $\tan x$, with x in radians
Rounding Functions	
<code>ceil(x)</code>	Rounds x to the nearest integer towards positive infinity: <code>ceil(3.1) = 4</code> and <code>ceil(-3.1) = -3</code> .
<code>fix(x)</code>	Rounds x to the nearest integer towards zero: <code>fix(3.1) = 3</code> and <code>fix(-3.1) = -3</code> .
<code>floor(x)</code>	Rounds x to the nearest integer towards minus infinity: <code>floor(3.1) = 3</code> and <code>floor(-3.1) = -4</code> .
<code>round(x)</code>	Rounds x to the nearest integer.
String Conversion Functions	
<code>char(x)</code>	Converts a matrix of numbers into a character string. For ASCII characters the matrix should contain numbers ≤ 127
<code>double(x)</code>	Converts a character string into a matrix of numbers.
<code>int2str(x)</code>	Converts x into an integer character string.
<code>num2str(x)</code>	Converts x into a character string.
<code>str2num(s)</code>	Converts character string s into a numeric array.

Commands and Functions

...	Continues a MATLAB statement on the following line.
abs(x)	Calculates the absolute value of x .
ans	Default variable used to store the result of expressions not assigned to another variable.
acos(x)	Calculates the inverse cosine of x . The resulting angle is in radians between 0 and π .
asin(x)	Calculates the inverse sine of x . The resulting angle is in radians between $-\pi/2$ and $\pi/2$.
atan(x)	Calculates the inverse tangent of x . The resulting angle is in radians between $-\pi/2$ and $\pi/2$.
atan2(y,x)	Calculates the inverse tangent of y/x , valid over the entire circle. The resulting angle is in radians between $-\pi$ and π .
ceil(x)	Rounds x to the nearest integer towards positive infinity: <code>floor(3.1) = 4</code> and <code>floor(-3.1) = -3</code> .

(continued)

Commands and Functions (Continued)

<code>char</code>	Converts a matrix of numbers into a character string. For ASCII characters the matrix should contain numbers ≤ 127 .
<code>clock</code>	Current time
<code>cos(x)</code>	Calculates cosine of x , where x is in radians.
<code>date</code>	Current date
<code>disp</code>	Displays data in command window
<code>doc</code>	Open HTML Help Browser directly at a particular function description.
<code>double</code>	Converts a character string into a matrix of numbers.
<code>eps</code>	Represents machine precision
<code>exp(x)</code>	Calculates e^x .
<code>eye(n,m)</code>	Generates an identity matrix
<code>fix(x)</code>	Rounds x to the nearest integer towards zero: <code>fix(3.1) = 3</code> and <code>fix(-3.1) = -3</code> .
<code>floor(x)</code>	Rounds x to the nearest integer towards minus infinity: <code>floor(3.1) = 3</code> and <code>floor(-3.1) = -4</code> .
<code>format +</code>	Print + and - signs only
<code>format bank</code>	Print in "dollars and cents" format
<code>format compact</code>	Suppress extra linefeeds in output
<code>format hex</code>	Print hexadecimal display of bits
<code>format long</code>	Print with 14 digits after the decimal
<code>format long e</code>	Print with 15 digits plus exponent
<code>format long g</code>	Print with 15 digits with or without exponent
<code>format loose</code>	Print with extra linefeeds in output
<code>format rat</code>	Print as an approximate ratio of small integers
<code>format short</code>	Print with 4 digits after the decimal
<code>format short e</code>	Print with 5 digits plus exponent
<code>format short g</code>	Print with 5 digits with or without exponent
<code>fprintf</code>	Print formatted information
<code>grid</code>	Add / remove a grid from a plot
<code>i</code>	$\sqrt{-1}$
<code>Inf</code>	Represents machine infinity (∞)
<code>input</code>	Writes a prompt and reads a value from the keyboard
<code>int2str</code>	Converts x into an integer character string.
<code>j</code>	$\sqrt{-1}$
<code>legend</code>	Adds a legend to a plot
<code>length(arr)</code>	Returns the length of a vector, or the longest dimension of a 2-D array.

Commands and Functions (Continued)

load	Load data from a file
log(x)	Calculates the natural logarithm of x .
loglog	Generates a log-log plot
lookfor	Look for a matching term in the one-line MATLAB function descriptions.
max(x)	Returns the maximum value in vector x , and optionally the location of that value.
min(x)	Returns the minimum value in vector x , and optionally the location of that value.
mod(n,m)	Remainder or modulo function.
NaN	Represents not-a-number
num2str(x)	Converts x into a character string.
ones(n,m)	Generates an array of ones
pi	Represents the number π
plot	Generates a linear xy plot
print	Prints a Figure window
round(x)	Rounds x to the nearest integer
save	Saves data from workspace into a file
semilogx	Generates a log-linear plot
semilogy	Generates a linear-log plot
sin(x)	Calculates sine of x , where x is in radians.
size	Get number of rows and columns in an array
sqrt	Calculates the square root of a number
str2num	Converts a character string into a number
tan(x)	Calculates tangent of x , where x is in radians.
title	Adds a title to a plot
zeros	Generate an array of zeros
