Octave Quick Reference

Octave Version 1.1.1

Starting Octave

octave	start interactive Octave session
octave *file*	run Octave on commands in *file*
octave --help	describe command line options

Stopping Octave

quit or **exit**	exit Octave
INTERRUPT	(*e.g.* **C-c**) terminate current command and return to top-level prompt

Getting Help

help	list all commands and built-in variables
help *command*	briefly describe *command*
help -i	use Info to browse Octave manual
help -i *command*	search for *command* in Octave manual

Motion in Info

SPC or **C-v**	scroll forward one screenful
DEL or **M-v**	scroll backward one screenful
C-l	redraw the display

Node Selection in Info

n	select the next node
p	select the previous node
u	select the 'up' node
t	select the 'top' node
d	select the directory node
<	select the first node in the current file
>	select the last node in the current file
g	reads the name of a node and selects it
C-x k	kills the current node

Searching in Info

s	search for a string
C-s	search forward incrementally
C-r	search backward incrementally
i	search index & go to corresponding node
,	go to next match from last 'i' command

Command-Line Cursor Motion

C-b	move back one character
C-f	move forward one character
C-a	move the the start of the line
C-e	move to the end of the line
M-f	move forward a word
M-b	move backward a word
C-l	clear screen, reprinting current line at top

Inserting or Changing Text

M-TAB	insert a tab character
DEL	delete character to the left of the cursor
C-d	delete character under the cursor
C-v	add the next character verbatim
C-t	transpose characters at the point
M-t	transpose words at the point

[ ] surround optional arguments ... show one or more arguments

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Killing and Yanking

C-k	kill to the end of the line
C-y	yank the most recently killed text
M-d	kill to the end of the current word
M-DEL	kill the word behind the cursor
M-y	rotate the kill ring and yank the new top

Command Completion and History

TAB	complete a command or variable name
M-?	list possible completions
RET	enter the current line
C-p	move 'up' through the history list
C-n	move 'down' through the history list
M-<	move to the first line in the history
M->	move to the last line in the history
C-r	search backward in the history list
C-s	search forward in the history list
history [-q] [*N*]	list *N* previous history lines, omitting history numbers if **-q**
history -w [*file*]	write history to *file* (**~/.octave_hist** if no *file* argument)
history -r [*file*]	read history from *file* (**~/.octave_hist** if no *file* argument)
edit_history *lines*	edit and then run previous commands from the history list
run_history *lines*	run previous commands from the history list
[*beg*] [*end*]	Specify the first and last history commands to edit or run.

If *beg* is greater than *end*, reverse the list of commands before editing. If *end* is omitted, select commands from *beg* to the end of the history list. If both arguments are omitted, edit the previous item in the history list.

Shell Commands

cd *dir*	change working directory to *dir*
pwd	print working directory
ls [*options*]	print directory listing
getenv (*string*)	return value of named environment variable
system (*cmd*)	execute arbitrary shell command string

Matrices

Square brackets delimit literal matrices. Commas separate elements on the same row. Semicolons separate rows. Commas may be replaced by spaces, and semicolons may be replaced by one or more newlines. Elements of a matrix may be arbitrary expressions, provided that all the dimensions agree.

[*x*, *y*, ...]	enter a row vector
[*x*; *y*; ...]	enter a column vector
[*w*, *x*; *y*, *z*]	enter a 2×2 matrix

Ranges

base : *limit*

base : *incr* : *limit*

Specify a range of values beginning with *base* with no elements greater than *limit*. If it is omitted, the default value of *incr* is 1. Negative increments are permitted.

Strings and Common Escape Sequences

A *string constant* consists of a sequence of characters enclosed in either double-quote or single-quote marks.

****	a literal backslash
\"	a literal double-quote character
\'	a literal single-quote character
\n	newline, ASCII code 10
\t	horizontal tab, ASCII code 9

Index Expressions

var (*idx*)	select elements of a vector
var (*idx1*, *idx2*)	select elements of a matrix
scalar	select row (column) corresponding to *scalar*
vector	select rows (columns) corresponding to the elements of *vector*
range	select rows (columns) corresponding to the elements of *range*
:	select all rows (columns)

Global Variables

global *var1* ... Declare variables global.

Global variables may be accessed inside the body of a function without having to be passed in the function parameter list provided they are also declared global within the function.

Selected Built-in Variables

EDITOR	editor to use with **edit_history**
Inf, **NaN**	IEEE infinity, NaN
LOADPATH	path to search for function files
PAGER	program to use to paginate output
ans	last result not explicitly assigned
eps	machine precision
pi	π
realmax	maximum representable value
realmin	minimum representable value

automatic_replot	automatically redraw plots
do_fortran_indexing	Fortran-style indexing of matrices
implicit_str_to_num_ok	allow strings to become numbers
output_max_field_width	maximum numeric field width
output_precision	min significant figures displayed
page_screen_output	control whether output is paged
prefer_column_vectors	create column vectors by default
resize_on_range_error	automatic resizing of matrices
save_precision	digits stored by **save** command
silent_functions	suppress output from functions
warn_divide_by_zero	suppress divide by zero errors

commas_in_literal_matrix
control handling of spaces in matrices

ignore_function_time_stamp
ignore changes in function files during session

ok_to_lose_imaginary_part
allow complex to real conversion

prefer_zero_one_indexing
if ambiguous, prefer 0-1 style indexing

Arithmetic and Increment Operators

x **+** *y*	addition
x **-** *y*	subtraction
x ***** *y*	matrix multiplication
x **.*** *y*	element by element multiplication
x **/** *y*	right division, conceptually equivalent to **(inverse (y') * x')'**
x **./** *y*	element by element right division
x **** *y*	left division, conceptually equivalent to **inverse (x) * y**
x **.** *y*	element by element left division
x **^** *y*	power operator
x **.^** *y*	element by element power operator
- *x*	negation
+ *x*	unary plus (a no-op)
x **'**	complex conjugate transpose
x **.'**	transpose
++ *x* (**--** *x*)	increment (decrement) *x*, return *new* value
x **++** (*x* **--**)	increment (decrement) *x*, return *old* value

Assignment Expressions

var **=** *expr*	assign expression to variable
var **(***idx***) =** *expr*	assign expression to indexed variable

Comparison and Boolean Operators

These operators work on an element-by-element basis. Both arguments are always evaluated.

x **<** *y*	true if *x* is less than *y*
x **<=** *y*	true if *x* is less than or equal to *y*
x **==** *y*	true if *x* is greater than *y*
x **>=** *y*	true if *x* is greater than or equal to *y*
x **>** *y*	true if *x* is equal to *y*
x **!=** *y*	true if *x* is not equal to *y*
x **&** *y*	true if both *x* and *y* are true
x **|** *y*	true if at least one of *x* or *y* is true
! *bool*	true *bool* is false

Short-circuit Boolean Operators

Operators evaluate left-to-right, expecting scalar operands. Operands are only evaluated if necessary, stopping once overall truth value can be determined. Operands are converted to scalars by applying the **all** function.

x **&&** *y*	true if both *x* and *y* are true
x **||** *y*	true if at least one of *x* or *y* is true

Operator Precedence

Here is a table of the operators in Octave, in order of increasing precedence.

; ,	statement separators
=	assignment, groups left to right
|| &&	logical "or" and "and"
| &	element-wise "or" and "and"
< <= == >= > !=	relational operators
:	colon
+ -	addition and subtraction
*** / \ .* ./ .**	multiplication and division
' .'	transpose
+ - ++ -- !	unary minus, increment, logical "not"
^ .^	exponentiation

Statements

for *identifier* **=** *expr stmt-list* **endfor**
Execute *stmt-list* once for each column of *expr*. The variable *identifier* is set to the value of the current column during each iteration.

while (*condition***)** *stmt-list* **endwhile**
Execute *stmt-list* while *condition* is true.

break	exit innermost loop
continue	go to beginning of innermost loop
return	return to calling function

if (*condition***)** *if-body* [**else** *else-body*] **endif**
Execute *if-body* if *condition* is true, otherwise execute *else-body*.

if (*condition***)** *if-body* [**elseif** (*condition*) *elseif-body*] **endif**
Execute *if-body* if *condition* is true, otherwise execute the *elseif-body* corresponding to the first **elseif** condition that is true, otherwise execute *else-body*.
Any number of **elseif** clauses may appear in an **if** statement.

unwind_protect *body* **unwind_protect_cleanup** *cleanup* **end**
Execute *body*. Execute *cleanup* no matter how control exits *body*.

Defining Functions

function [*ret-list*] *function-name* [(*arg-list*)]
function-body
endfunction

ret-list may be a single identifier or a comma-separated list of identifiers delimited by square-brackets.
arg-list is a comma-separated list of identifiers and may be empty.

Basic Matrix Manipulations

rows (*a***)**	return number of rows of *a*
columns (*a***)**	return number of columns of *a*
all (*a***)**	check if all elements of *a* nonzero
any (*a***)**	check if any elements of *a* nonzero
find (*a***)**	return indices of nonzero elements
sort (*a***)**	order elements in each column of *a*
sum (*a***)**	sum elements in columns of *a*
prod (*a***)**	product of elements in columns of *a*
min (*args***)**	find minimum values
max (*args***)**	find maximum values
rem (*x***,** *y***)**	find remainder of *x*/*y*
reshape (*a***,** *m***,** *n***)**	reformat *a* to be *m* by *n*
diag (*v***,** *k***)**	create diagonal matrices
linspace (*b***,** *l***,** *n***)**	create vector of linearly-spaced elements
logspace (*b***,** *l***,** *n***)**	create vector of log-spaced elements
eye (*n***,** *m***)**	create *n* by *m* identity matrix
ones (*n***,** *m***)**	create *n* by *m* matrix of ones
zeros (*n***,** *m***)**	create *n* by *m* matrix of zeros
rand (*n***,** *m***)**	create *n* by *m* matrix of random values

Linear Algebra

chol (*a***)**	Cholesky factorization
det (*a***)**	compute the determinant of a matrix
eig (*a***)**	eigenvalues and eigenvectors
expm (*a***)**	compute the exponential of a matrix
hess (*a***)**	compute Hessenberg decomposition
inverse (*a***)**	invert a square matrix
norm (*a***,** *p***)**	compute the *p*-norm of a matrix
pinv (*a***)**	compute pseudoinverse of *a*
qr (*a***)**	compute the QR factorization of a matrix
rank (*a***)**	matrix rank
schur (*a***)**	Schur decomposition of a matrix
svd (*a***)**	singular value decomposition
syl (*a***,** *b***,** *c***)**	solve the Sylvester equation

Equations, ODEs, DAEs, Quadrature

***fsolve**	solve nonlinear algebraic equations
***lsode**	integrate nonlinear ODEs
***dassl**	integrate nonlinear DAEs
***quad**	integrate nonlinear functions

perror (*nm***,** *code***)** for functions that return numeric codes, print error message for named function and given error code

* See the on-line or printed manual for the complete list of arguments for these functions.

Signal Processing

fft (*a***)**	Fast Fourier Transform using FFTPACK
ifft (*a***)**	inverse FFT using FFTPACK
freqz (*args***)**	FIR filter frequency response
sinc (*x***)**	returns **sin (π x)/(π x)**

Image Processing

colormap (*map***)**	set the current colormap
gray2ind (*i***,** *n***)**	convert gray scale to Octave image
image (*img***,** *zoom***)**	display an Octave image matrix
imagesc (*img***,** *zoom***)**	display scaled matrix as image
imshow (*img***,** *map***)**	display Octave image
imshow (*i***,** *n***)**	display gray scale image
imshow (*r***,** *g***,** *b***)**	display RGB image
ind2gray (*img***,** *map***)**	convert Octave image to gray scale
ind2rgb (*img***,** *map***)**	convert indexed image to RGB
loadimage (*file***)**	load an image file
rgb2ind (*r***,** *g***,** *b***)**	convert RGB to Octave image
saveimage (*file***,** *img***,** *fmt***,** *map***)**	save a matrix to *file*

Sets

create_set (*a***,** *b***)**	create row vector of unique values
complement (*a***,** *b***)**	elements of *b* not in *a*
intersection (*a***,** *b***)**	intersection of sets *a* and *b*
union (*a***,** *b***)**	union of sets *a* and *b*

Strings

strcmp (*s***,** *t***)**	compare strings
strcat (*s***,** *t***,** ...**)**	concatenate strings

C-style Input and Output

fopen (*name*, *mode*)	open file *name*
fclose (*file*)	close *file*
printf (*fmt*, ...)	formatted output to **stdout**
fprintf (*file*, *fmt*, ...)	formatted output to *file*
sprintf (*fmt*, ...)	formatted output to string
scanf (*fmt*)	formatted input from **stdin**
fscanf (*file*, *fmt*)	formatted input from *file*
sscanf (*str*, *fmt*)	formatted input from *string*
fgets (*file*, *len*)	read *len* characters from *file*
fflush (*file*)	flush pending output to *file*
ftell (*file*)	return file pointer position
frewind (*file*)	move file pointer to beginning
freport	print a info for open files
fread (*file*, *size*, *prec*)	read binary data files
fwrite (*file*, *size*, *prec*)	write binary data files
feof (*file*)	determine if pointer is at EOF

A file may be referenced either by name or by the number returned from **fopen**. Three files are preconnected when Octave starts: **stdin**, **stdout**, and **stderr**.

Other Input and Output functions

save *file var* ...	save variables in *file*
load *file*	load variables from *file*
disp (*var*)	display value of *var* to screen

Miscellaneous Functions

eval (*str*)	evaluate *str* as a command
feval (*str*, ...)	evaluate function named by *str*, passing remaining args to called function
error (*message*)	print message and return to top level
clear *pattern*	clear variables matching pattern
exist (*str*)	check existence of variable or function
who	list current variables

Polynomials

compan (*p*)	companion matrix
conv (*a*, *b*)	convolution
deconv (*a*, *b*)	deconvolve two vectors
poly (*a*)	create polynomial from a matrix
polyderiv (*p*)	derivative of polynomial
polyreduce (*p*)	integral of polynomial
polyval (*p*, *x*)	value of polynomial at *x*
polyvalm (*p*, *x*)	value of polynomial at *x*
roots (*p*)	polynomial roots
residue (*a*, *b*)	partial fraction expansion of ratio *a*/*b*

Statistics

corrcoef (*x*, *y*)	correlation coefficient
cov (*x*, *y*)	covariance
mean (*a*)	mean value
median (*a*)	median value
std (*a*)	standard deviation
var (*a*)	variance

Basic Plotting

gplot [*ranges*] *expr* [*using*] [*title*] [*style*]	2D plotting
gsplot [*ranges*] *expr* [*using*] [*title*] [*style*]	3D plotting

ranges	specify data ranges
expr	expression to plot
using	specify columns to plot
title	specify line title for legend
style	specify line style

If *ranges* are supplied, they must come before the expression to plot. The *using*, *title*, and *style* options may appear in any order after *expr*. Multiple expressions may be plotted with a single command by separating them with commas.

set *options*	set plotting options
show *options*	show plotting options
replot	redisplay current plot
closeplot	close stream to **gnuplot** process
purge_tmp_files	clean up temporary plotting files
automatic_replot	built-in variable

Other Plotting Functions

plot (*args*)	2D plot with linear axes
semilogx (*args*)	2D plot with logarithmic x-axis
semilogy (*args*)	2D plot with logarithmic y-axis
loglog (*args*)	2D plot with logarithmic axes
bar (*args*)	plot bar charts
stairs (*x*, *y*)	plot stairsteps
hist (*y*, *x*)	plot histograms
title (*string*)	set plot title
axis (*limits*)	set axis ranges
xlabel (*string*)	set x-axis label
ylabel (*string*)	set y-axis label
grid [on|off]	set grid state
hold [on|off]	set hold state
ishold	return 1 if hold is on, 0 otherwise
mesh (*x*, *y*, *z*)	plot 3D surface
meshdom (*x*, *y*)	create mesh coordinate matrices

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