

A Matlab Cheat-sheet (MIT 18.06, Fall 2007)

Basics:

save 'file.mat'	save variables to <i>file.mat</i>
load 'file.mat'	load variables from <i>file.mat</i>
diary on	record input/output to file <i>diary</i>
diary off	stop recording
whos	list all variables currently defined
clear	delete/undefine all variables
help command	quick help on a given <i>command</i>
doc command	extensive help on a given <i>command</i>

Defining/changing variables:

x = 3	define variable <i>x</i> to be 3
x = [1 2 3]	set <i>x</i> to the 1×3 row-vector (1,2,3)
x = [1 2 3];	same, but don't echo <i>x</i> to output
x = [1;2;3]	set <i>x</i> to the 3×1 column-vector (1,2,3)
A = [1 2 3 4; 5 6 7 8; 9 10 11 12];	set <i>A</i> to the 3×4 matrix with rows 1,2,3,4 etc.
x(2) = 7	change <i>x</i> from (1,2,3) to (1,7,3)
A(2,1) = 0	change $A_{2,1}$ from 5 to 0

Arithmetic and functions of numbers:

3*4, 7+4, 2-6 8/3	multiply, add, subtract, and divide numbers
3^7, 3^(8+2i)	compute 3 to the 7th power, or 3 to the 8+2i power
sqrt(-5)	compute the square root of -5
exp(12)	compute e^{12}
log(3), log10(100)	compute the natural log (ln) and base-10 log (\log_{10})
abs(-5)	compute the absolute value -5
sin(5*pi/3)	compute the sine of $5\pi/3$
besselj(2,6)	compute the Bessel function $J_2(6)$

Arithmetic and functions of vectors and matrices:

x * 3	multiply every element of <i>x</i> by 3
x + 2	add 2 to every element of <i>x</i>
x + y	element-wise addition of two vectors <i>x</i> and <i>y</i>
A * y	product of a matrix <i>A</i> and a vector <i>y</i>
A * B	product of two matrices <i>A</i> and <i>B</i>
x * y	not allowed if <i>x</i> and <i>y</i> are two column vectors!
x .* y	element-wise product of vectors <i>x</i> and <i>y</i>
A^3	the square matrix <i>A</i> to the 3rd power
x^3	not allowed if <i>x</i> is not a square matrix!
x.^3	every element of <i>x</i> is taken to the 3rd power
cos(x)	the cosine of every element of <i>x</i>
abs(A)	the absolute value of every element of <i>A</i>
exp(A)	<i>e</i> to the power of every element of <i>A</i>
sqrt(A)	the square root of every element of <i>A</i>
expm(A)	the matrix exponential e^A
sqrtm(A)	the matrix whose square is <i>A</i>

Transposes and dot products:

x.', A.'	the transposes of <i>x</i> and <i>A</i>
x', A'	the complex-conjugate of the transposes of <i>x</i> and <i>A</i>
x' * y	the dot (inner) product of two <i>column</i> vectors <i>x</i> and <i>y</i>
dot(x,y), sum(x.*y)	...two other ways to write the dot product
x * y'	the <i>outer</i> product of two <i>column</i> vectors <i>x</i> and <i>y</i>

Constructing a few simple matrices:

rand(12,4)	a 12×4 matrix with uniform random numbers in [0,1)
randn(12,4)	a 12×4 matrix with Gaussian random (center 0, variance 1)
zeros(12,4)	a 12×4 matrix of zeros
ones(12,4)	a 12×4 matrix of ones
eye(5)	a 5×5 identity matrix <i>I</i> ("eye")
eye(12,4)	a 12×4 matrix whose first 4 rows are the 4×4 identity
linspace(1.2,4.7,100)	row vector of 100 equally-spaced numbers from 1.2 to 4.7
7:15	row vector of 7,8,9,...,14,15
diag(x)	matrix whose diagonal is the entries of <i>x</i> (and other elements = 0)

Portions of matrices and vectors:

x(2:12)	the 2nd to the 12th elements of <i>x</i>
x(2:end)	the 2nd to the last elements of <i>x</i>
x(1:3:end)	every third element of <i>x</i> , from 1st to the last
x(:)	all the elements of <i>x</i>
A(5,:)	the row vector of every element in the 5th row of <i>A</i>
A(5,1:3)	the row vector of the first 3 elements in the 5th row of <i>A</i>
A(:,2)	the column vector of every element in the 2nd column of <i>A</i>
diag(A)	column vector of the diagonal elements of <i>A</i>

Solving linear equations:

A \ b	for <i>A</i> a matrix and <i>b</i> a column vector, the solution <i>x</i> to $Ax=b$
inv(A)	the inverse matrix A^{-1}
[L,U,P] = lu(A)	the LU factorization $PA=LU$
eig(A)	the eigenvalues of <i>A</i>
[V,D] = eig(A)	the columns of <i>V</i> are the eigenvectors of <i>A</i> , and the diagonals diag(D) are the eigenvalues of <i>A</i>

Plotting:

plot(y)	plot <i>y</i> as the <i>y</i> axis, with 1,2,3,... as the <i>x</i> axis
plot(x,y)	plot <i>y</i> versus <i>x</i> (must have same length)
plot(x,A)	plot columns of <i>A</i> versus <i>x</i> (must have same # rows)
loglog(x,y)	plot <i>y</i> versus <i>x</i> on a log-log scale
semilogx(x,y)	plot <i>y</i> versus <i>x</i> with <i>x</i> on a log scale
semilogy(x,y)	plot <i>y</i> versus <i>x</i> with <i>y</i> on a log scale
fplot(@ (x) ...expression..., [a,b])	plot some expression in <i>x</i> from $x=a$ to $x=b$
axis equal	force the <i>x</i> and <i>y</i> axes of the current plot to be scaled equally
title('A Title')	add a title <i>A Title</i> at the top of the plot
xlabel('blah')	label the <i>x</i> axis as <i>blah</i>
ylabel('blah')	label the <i>y</i> axis as <i>blah</i>
legend('foo', 'bar')	label 2 curves in the plot <i>foo</i> and <i>bar</i>
grid	include a grid in the plot
figure	open up a new figure window