

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

Basics:

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

Defining/changing variables:

$x = 3$ define variable x to be 3
 $x = [1 \ 2 \ 3]$ set x to the 1×3 row-vector (1,2,3)
 $x = [1 \ 2 \ 3];$ same, but don't echo x to output
 $x = [1;2;3]$ set x to the 3×1 column-vector (1,2,3)
 $A = [1 \ 2 \ 3 \ 4; 5 \ 6 \ 7 \ 8; 9 \ 10 \ 11 \ 12];$
 set A to the 3×4 matrix with rows 1,2,3,4 etc.
 $x(2) = 7$ change x 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
 $\text{sqrt}(-5)$ compute the square root of -5
 $\text{exp}(12)$ compute e^{12}
 $\log(3), \log_{10}(100)$ compute the natural log (ln) and base-10 log ($\log_{10}$)
 $\text{abs}(-5)$ compute the absolute value $|-5|$
 $\sin(5\pi/3)$ compute the sine of $5\pi/3$
 $\text{besselj}(2,6)$ compute the Bessel function $J_2(6)$

Arithmetic and functions of vectors and matrices:

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

Transposes and dot products:

$x.', A.'$ the transposes of x and A
 x', A' the complex-conjugate of the transposes of x and A
 $x' * y$ the dot (inner) product of two column vectors x and y

Constructing a few simple matrices:

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

Portions of matrices and vectors:

$x(2:12)$ the 2nd to the 12th elements of x
 $x(2:\text{end})$ the 2nd to the last elements of x
 $x(1:3:\text{end})$ every third element of x , from 1st to the last
 $x(:)$ all the elements of x
 $A(5,:)$ the row vector of every element in the 5th row of A
 $A(5,1:3)$ the row vector of the first 3 elements in the 5th row of A
 $A(:,2)$ the column vector of every element in the 2nd column of A
 $\text{diag}(A)$ column vector of the diagonal elements of A

Solving linear equations:

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

Plotting:

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

det(A)

finds determinant of A

$\text{dot}(x,y), \text{sum}(x.*y)$...two other ways to write the dot product
 $x * y'$ the outer product of two column vectors x and y