Matlab for Pedestrians, Part 1: Basic Commands

Starting a Matlab session. Press the middle mouse button, select the "Mathematics" entry, and then select the "MATLAB 5.0" entry – this will start up a Matlab session in its own window.

Quitting Matlab. Type the command quit and press "enter."

Starting a text editor. It will also be convenient to start a text editor. If you are not familiar with Unix, then it is recommended to invoke the standard graphical editor by first clicking on the arrow above the picture of the terminal (at the bottom of the screen), and then selecting the "Text Editor" entry – this will start up the text editor in its own window.

You are now ready to start the Matlab exercise; follow the instructions below, and be careful to type the Matlab expressions exactly as they are printed here. Note the character $\mathcal{T}$ which implies that the text should be typed in the text editor – all other commands are typed in the Matlab window after the Matlab prompt >>. Notice that you can recall previous Matlab commands by means of the "up-arrow." Recalled commands can also be edited.

1.	x = 22/7	Create the variable x whose value is 22/7. Notice that Matlab returns the value of x.
2.	x = [1 2 3]	Now x is a row vector with three elements.
3.	x	Show the value of the variable x.
4.	y = [4; 5; 6]	The variable y is a column vector.
5.	y = [4; 5; 6];	The semicolon suppresses the listing of the variable.
6.	x = x', y = y'	Now x and y have been transposed. Commands are separated by a comma or a semicolon.
7.	pi	This is a predefined variable whose value is π.
8.	z = cos(x)	A vector can be used as an argument to a function.
9.	t = linspace(-2,2,101);	This t is a row vector with 101 entries: $-2,\ -2+0.04,\ -2+0.08,\ \ldots,\ 2$.
10.	plot(t,exp(t))	Plot e^t for $-2 \le t \le 2$. Notice that a graphics window now appears.
11.	x.*z	Elementwise multiplication of the two vectors x and z.
12.	x*z	Multiplication of x and z is not defined.
13.	x.^3	Raise each element of x to the third power.
14.	$\mathcal{T}$ p = 0.6; $\mathcal{T}$ plot(t,(1-p*cos(pi*t))./... $\mathcal{T}$ (1-2*p*cos(pi*t)) + p^2))	Enter these three lines in the text editor, and save the file as script1.m. Such a file containing Matlab commands is called a "script."
15.	script1	Execute the script1 script.
16.	type script1	List the contents of the file script1.m.
17.	$\mathcal{T}$ function f = fun1(p,t) $\mathcal{T}$ f = (1-p*cos(pi*t))./... $\mathcal{T}$ (1-2*p*cos(pi*t) + p^2);	Enter these three lines in the text editor, and save the file as fun1.m. The present file, starting with the command function, is an example of a "function".
18.	clf	Clear the graphics window.
19.	plot(t,fun1(p,t))	Same effect as 15, but using the fun1 function.
20.	T = 19; y = sqrt(T); x = 3;	Now y = $\sqrt{19}$ and x is a first guess.
21.	x = (x + T/x)/2	First step of Heron's method for computing $\sqrt{T}$.
22.	x = (x + T/x)/2	Second step; use the "up arrow" to recall the command.
23.	y - x, (x - y)/y	Absolute and relative error.
24.	T - [x y].^2	Check the two approximations to $\sqrt{T}$.

Matlab for Pedestraints, Part 2: Linear Algebra

At this stage, you may close the text editor – you won't need it anymore.

25.	`x = [1; 2]; y = [3; 4];`	Enter two column vectors.
26.	`a = x'*y`	Inner product of x and y, i.e., a scalar.
27.	`B = x*y'`	Outer product of x and y, i.e., a matrix.
28.	`c = x.*y`	Elementwise product of x and y, i.e., a vector.
29.	`norm(y)`	The 2-norm of y, i.e., $\|y\|_2 = \sqrt{y_1^2 + y_2^2}$.
30.	`y = y - x*(x'*y/norm(x)^2)`	Orthogonalize y with respect to x.
31.	`A = [1 2;3 4], b = [3; 5]`	Enter matrix A and column vector b.
32.	`x = A\b`	Solve the linear system A x = b.
33.	`r = b - A*x, norm(r)`	The residual and its 2-norm.
34.	`[L,U,P] = lu(A)`	Compute an LU factorization of A using partial pivoting: A P = L U.
35.	`[Q,R] = qr(A)`	Compute a QR factorization: A = Q R.
36.	`B = A + A'`	The matrix B is symmetric.
37.	`C = chol(B)`	The Cholesky factorization of B does not exist.
38.	`B(2,2) = 13`	Modify B to make it positive definite.
39.	`C = chol(B)`	Now the Cholesky factorization exists: $A = C^T C$.
40.	`A = [1 2 3; 4 5 6;7 8 9]; rank(A)`	A rank-deficient matrix and its rank.

Matlab for Pedestraints, Part 3: Plots

41.	`x = linspace(0,5,200)';`	Column vector with abscissas.
42.	`y = exp(-x).*sin(pi*x);`	Column vector with ordinates.
43.	`plot(x,y)`	Plot y versus x.
44.	`xlabel('Time')`	Add legend to x-axis.
45.	`ylabel('Power')`	Add legend to y-axis.
46.	`title('First plot')`	Add title to plot.
47.	`z = exp(-x/2).*sin(pi*x).^2;`	More artificial data.
48.	`plot(x,[y,z])`	Plot the two column vectors y and z versus x.
49.	`legend('Data 1','Data 2')`	Add legends.
50.	`plot(x,y,'-r',x,z,':b')`	Individual control of the two curves.
51.	`clf`	Clear graphics screen.
52.	`A = randn(25,25);`	The elements of A are normally distributed.
53.	`s = svd(A);`	Compute the singular values of A.
54.	`plot(s,'o')`	Plot discrete data as o-markers.
55.	`logspace(s,'-o')`	Semi-logarithmic plot with line and markers.
56.	`plot(s,'o','markersize',10)`	Control the marker size.
57.	`axis([0 10 0 10])`	Manual control af axes.
58.	`print -Pgps2`	Print the current plot on predefined printer.
59.	`figure(2), plot(rand(10,1))`	Open a second graphics window with random data. Move the graphics windows in order to see both.
60.	`figure(1), title('Last plot')`	Make first graphics window active, and add title.

If you have reached this point succesfully, you are entitled to a Matlab driver's license.