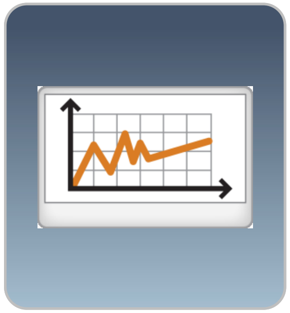

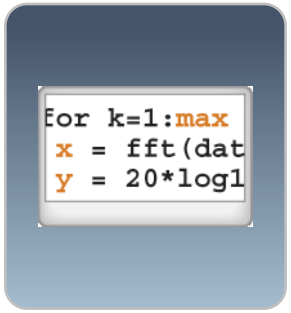

Chapter 1

MATLAB Recapitulation

- Exercises -

Exercise 1 - Manipulating Data

1.1 Create a 4x3 matrix of random numbers

- Extract the elements at locations (1,2) and (2,3).
- Extract the element in the lower right.
- Set every value between 0 and 0.5.

1.2 Create a diagonal matrix of size 4x4 with 3 on the diagonal.

1.3 Solve Ax = b for A = magic(3) and b = $[1\ 2\ 3]^T$

- Compute eigenvalues of A.

Exercise 2 - For and While loops

2.1 Use ***for-loop*** and ***while-loop*** to find approximation of the differential equation below, with a step size of $\Delta t = 0.01\,\text{second}$ (use Euler's method for approximation) :

$$(i)\quad \frac{dy}{dt} = t^2 - y^2, \quad y(0) = 1, \quad t_{final} = 2\text{ seconds}$$

$$(ii)\quad \frac{dy}{dt} = t - |y|, \quad y(0) = 1, \quad t_{final} = 2\text{ seconds}$$

Steps to do:

a) Define step size Δt.

b) Use ***for-loop*** or ***while-loop*** to approximate y.

c) Plot the results.

Hints: Euler‘s method

http://tutorial.math.lamar.edu/Classes/DE/EulersMethod.aspx

Exercise 3 - Scripts and Functions

3.1 Use both ***script m-files*** and ***function m-files*** to generate a graph for the following equations:

$$(i)\quad y(x) = x^2, \quad \text{for } -1 \le x \le 1$$

$$(ii)\quad y(x) = \left[\frac{e^{-x}}{x^2+1} + \sin^2(x)\right]^2 + 0.2, \quad \text{for } -1 \le x \le 1$$

Steps to do:

a) Create ***script*** m-files for both equations.

b) Create ***function*** m-files for both equations.

c) Plot the results.

Exercise 4 – Algorithm developoment

4.1 Write codes to count the prime numbers between lower and upper bounds and show elapsed times to run these programs.

Steps to do:

a) Create ***script*** m-files (save it as *“primzahl.m”*) to calculate the prime numbers at given input range *[lower, upper]* using conventional MATLAB syntax (for, if, etc.).

b) Fill your code with a stopwatch timer function (***tic*** and ***toc***) to measure elapsed time.