# Self-study 2

Consider the following example of a Matlab file (that is with extension `.m`) which contains the content as below:

```
% Code for Exercise xx
'Exercise xx'
A=[ 1 2;
    3 6]
B=[ 7  8;
   -1 -2]
'The product is:'
A*B'
```

If this file is saved as *exercise_xx.m*, it can be executed in Matlab simply by opening the file in Matlab (double clicking on the file should do the job) and pressing the 'Run' button (and confirming <add to path> in case asked for it). Note that lines where the first character is the % character are comment lines that are only visible in the text file itself and are not executed; such as for instance the line:

```
% Code for exercise xx
```

Further note that by using quotation marks you can make Matlab write a text string to the command window. This is for instance the case for the line: `'The product is:'`.

Use `.m`-files when answering the self-study below.

## Task 1

In a text-editor, create a .m-file, in which you define two matrices $A$ and $B$ and compute their product. You can use the template above. Call the file for instance `matrix-product-file_v1.m` and save it in the current working directory. Now run the m-file.

Remarks: 1) It is important that the file has the .m-extension, as otherwise the file is not recognized as a Matlab executable file, 2) The working directory of Matlab can be changed in the Matlab directory tree as displayed below,
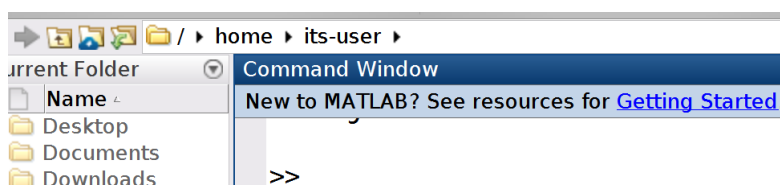
or by using the cd command see: `https:se.mathworks.com/help/matlab/ref/cd.html`.

## Task 2

We investigate Kirchoff's laws, which describe how electrical current behaves in electrical circuits. Applying these laws results in that the various electrical currents are described by a system of linear equations. By solving this linear system, the current flowing through each wire in the circuit is determined.

Read section *Current Flow in Electrical Circuits* at pages 60—62 in the book. Note that the solutions to Practice Problems 2 and 3 can be found at page 65.

Then solve the exercises 25, 27, 29 and 30 on page 64. That is determine the linear equations for the various circuits. As for each electrical network, the linear system is consistent, only one unique solution for the various currents exists, and only one unique solution is found when solving the system by the `rref` command in Matlab.

## Task 3

We consider $(0, 1)$-matrices, which can be used to represent how to sets of objects are related.

For instance, $(0, 1)$-matrices can indicate whether a flight route exists between two airports. Read the section named "$(0, 1)$-Matrices" at pages 112—115 in the book. Notice that the solution to Practice Problem 3 can be found at page 122. Then solve exercises 21, 22 on page 120.

## Task 4

Solve the Matlab-exercises 1, 3, 5 and 7 on page 195 and 196.

Extra: if you have time left you can make exercise 26 on page 121.