

SCIENTIFIC & ENGINEERING PROGRAMMING

II Year Electronics and Computer Engineering, FoEPhaM, WUST

1 Mathematica Lab Class 1 – Mathematica basics

1.1 The scope

To get familiar with tools, work methodology, and Mathematica interfaces. To perform basic calculations with vectors and matrices.

1.2 Prerequisites

Before starting the classes, please set up a free account on the Wolfram Cloud platform <https://www.wolframcloud.com/>.

1.3 Tasks

1.3.1 Wolfram Cloud Mathematica

1. Get familiar with the Wolfram Cloud layout.
2. Exercise the “Five Minute Hands-On” intro from Welcome to Wolfram Cloud section (Quick Links) – while playing observe text color changes (blue, black, purple, red), hints menu.
3. Exercise the “Some Things to Try” from Welcome to Wolfram Cloud section.
4. Watch 1-Minute Video from Welcome to Wolfram Cloud section.
5. Create your first Mathematica Notebook, try to manipulate it (download, duplicate, print to PDF).
6. Notice the Language Intro and Documentation sections.

1.3.2 Local Mathematica

7. Start local Mathematica session, try to repeat the exercises done in Wolfram Cloud, open files downloaded from the Cloud.
8. Try to perform some arithmetic calculations, use trigonometric functions.
9. Exercise the examples depicted in points 1-9 of `mathematica_basics_digest.*` file provided in materials section.

1.3.3 Vectors and matrices

10. Define lists representing the following vectors and matrices

$$a = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, b = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, m = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}, n = \begin{bmatrix} 3 & 4 & 5 \\ 6 & 7 & 8 \\ 9 & 10 & 11 \end{bmatrix}, p = \begin{bmatrix} 3 & 4 \\ 5 & 6 \\ 7 & 8 \end{bmatrix}, q = \begin{bmatrix} 3 & 4 & 5 \\ 6 & 7 & 8 \end{bmatrix}.$$

11. Multiply them by scalar values, observe the behaviour.
12. Define a vector $m1$ which is the first row of the matrix m . Define $p2$ which is the second row of p .
13. Define a matrix $m12$ consisting of first two rows of the matrix m . Define $m13$ composed of rows 1 and 3 of m .
14. Define a matrix mp which is the matrix m with matrix p appended. Repeat the same form matrices m and q .
15. Try to manipulate the defined objects (add, subtract, multiply, transpose, compute determinant), observe the error messages when combining objects of inappropriate dimensions.

1.3.4 Optional

16. Browse the website <https://demonstrations.wolfram.com/>. Run some demos (for example from Engineering & Technology: Robotics section).