

Practical Worksheet 01 – Basics of Matlab

Exercise 01

Use the command window to initialize the following variables (the expression is correct if the qnszer is `var = 50`):

- $a = e^{\ln 50}$.
- $b = 100 \sin \frac{\pi}{6}$.
- $c = \lfloor e^\pi \rfloor + \lfloor \pi^e \rfloor + \lfloor \pi \rfloor + \lfloor e \rfloor$.
- $d = \frac{2^{\frac{(2*2)!}{2+2}} + 22 + 2^{2^2} - \sqrt{2^2}}{2^{2-\frac{2}{2}}}$.
- $f = 0.5 * (5 + 5)^{\frac{5^0}{0.5}}$.
- $g = 5 * \left(\frac{5}{0.5} + 5^0 \right) - 5$.
- $k = \frac{3^{3!} - 3^{3-3^0}}{3^3 - 3^0} - 30$.

Exercise 02

Use the command window to initialize the following arrays

- $A = (1 \ 2 \ 3); B = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}; C = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$.
- D = a row array containing all the even numbers from 0 to 1000.
- E = a column array containing all the odd numbers from 0 to 1000.
- F = a row array containing 100 numbers spread evenly on the interval [3 ; 15].
- G = a magic matrix of size 3.
- H = an identity matrix of size 4.
- I = a random matrix of 2 rows and 3 columns.

Exercise 03

- Create the following matrices:

$$A = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}.$$

$$D = \begin{pmatrix} 1 & 4 & 7 & 10 & 13 & 16 & 19 & 22 & 25 \\ 72 & 66 & 60 & 54 & 48 & 42 & 36 & 30 & 24 \\ 0 & 0.125 & 0.25 & 0.375 & 0.5 & 0.625 & 0.75 & 0.875 & 1 \end{pmatrix}.$$

$$E = \begin{pmatrix} 6 & 43 & 2 & 11 & 87 \\ 12 & 6 & 34 & 0 & 5 \\ 34 & 18 & 7 & 41 & 9 \end{pmatrix}.$$

- Calculate $F = E^T$.
- Calculate $X = D * F$.
- Calculate $Y = F * D$.
- Create a row vector $\mathbf{vc}$ of size 10 containing the elements of the first and the last row of E , and a column vector $\mathbf{vd}$ of size 6 containing the elements of the second and forth column of E .
- Remove the last row and the third column of E .

Exercise 04

Write a Matlab script that prompts the user for a positive integer N , then calculates and displays the sum of the digits that make up the integer.

Exercise 05:

1. Write a Matlab function that takes as input a positive integer, and returns as result an array containing all its divisors.
Examples : Input $\rightarrow 9$; output $\rightarrow [1, 3, 9]$.
Input $\rightarrow 10$; output $\rightarrow [1, 2, 5, 10]$.
Input $\rightarrow 11$; output $\rightarrow [1, 11]$.
2. Write a Matlab function that takes a positive integer as input and determines whether it is a prime number or not. The function should return **1** if the number is prime and **0** otherwise.
3. Write a Matlab script that asks the user to enter a positive integer N , then if the number is prime displays: "the number (value of N) is prime". Otherwise display "the number (value of N) is not prime".

Exercise 06:

Explain the result of each of the following commands:

1. `0.1 + 0.2 == 0.3`
2. `1 + 1e16 - 1e16`
3. `1 + (1e16 - 1e16)`
4. `realmax * 2`
5. `v = rand(1, 10000000);`
`sum(v(end:-1:1)) == sum(v)`