

Lab Session 1

MATLAB Tutorial - A non-exhaustive list of useful operations and commands

1. Defining scalars, vectors and matrices `[]`, `;`
 2. Enumeration `:`
 3. Indexing `()`, `:`, `end`
 4. Empty matrix `[]`, Zero matrix `zeros()`, Ones matrix `ones()`
 5. Diagonal matrix `diag()`, Identity matrix `eye()`
 6. Displaying and suppressing output `;`, Printing formatted text `sprintf()`
 7. Commenting `%`
 8. Concatenating and resizing matrices `[]`, `reshape()`, `repmat()`
 9. Arithmetic operations `+`, `-`, `*`, `/`, `^`, `ceil()`, `floor()`, `round()`, `mod()`, `rem()`
 10. Matrix operations `length()`, `size()`, `sum()`, `prod()`, `inv()`, `.*`, `./`, `.^`, `'`
 11. Relational operations `>`, `<`, `==`, `~=`, `>=`, `<=`
 12. Logical operations `&&`, `||`, `~`, `true`, `false`, `find()`
 13. Conditional statements `if-end`, `if-else-end`, `if-elseif-else-end`, `switch-case-end`
 14. Loops `for-end`, `while-end`, `break`, `continue`
 15. Sorting `sort()`, `sortrows()`, `min()`, `max()`, `unique()`
 16. Statistics `mean()`, `var()`, `std()`, `median()`, `mode()`
 17. Random number generation `rand()`, `randi()`, `randn()`, `rng()`
 18. 2D plotting `plot()`, `hold`, `subplot()`, `xlim()`, `ylim()`, `figure()`, `xlabel()`, `ylabel()`
 19. 3D plotting `plot3()`, `zlim()`, `zlabel()`, `meshgrid()`, `surf()`, `contour()`, `colormap()`
 20. Mathematical functions `sqrt()`, `exp()`, `sin()`, `cos()`, `tan()`, `log()`
 21. User-defined functions `function [output_args] = functionName (input_args)`
 22. Utility functions `cd`, `clear`, `clc`, `format`, `help`, `lookfor`, `ver`
 23. File handling `load()`, `fopen()`, `fscanf()`, `fprintf()`, `fclose()`, `save()`
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Exercises:

1. Define a 4×10 matrix with multiples of 2, 3, 5 and 7 in each of the rows.
 2. Create a random 5×5 matrix using the `rand()` function and a seed value of 4.
 - (a) Square the elements of the first row.
 - (b) Cube the elements of the second column.
 - (c) Increment the third column elements by 1.
 - (d) Add the second row elements to corresponding fourth row elements.
 - (e) Replace the fifth row with a vector of ones.
 - (f) Delete the last column.
 3. Find the minimum value of the third column of a matrix formed by the product of two matrices of size 10×10 randomly generated using a seed values of 4 and 5.
 4. Find the sum of first 100 Fibonacci numbers.
 5. Plot the following functions:
 - (a) $y = x^3 \cos(x) + 7x - 10$ in the interval $x \in [-5, 5]$.
 - (b) $y = x^3 - 6x^2 + 4x + 12$ in the interval $x \in [-3, 6]$.
 - (c) $y = x$, $y = x^2$ and $y = e^x$ in the interval $x \in [-5, 5]$ on the same plot.
 - (d) $f(x, y) = 20 + (x^2 - 10 \cos(2\pi x)) + (y^2 - 10 \cos(2\pi y))$ in the interval $x, y \in [-5, 5]$.
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