

Final Exam
Programming Tools for Mathematics

Exercise 01: (03pts) What are the results of the following commands:

$3 \setminus 6 * 4 + 2^3$, $\text{sqrt}(-9)$, $\text{conj}(4 * i - 3)$, $\log_2(4) + 3$, $0/0$
 $2 \ln(1) + 3$, $(1 + 2 \leq 3)$, $\text{syms } x, \text{eq} = x^2 + 4$, $\text{solve}(\text{eq})$

Exercise 02: (07pts)

1. Write a Matlab script that takes a student's score as input and outputs their grade classification (Using switch/case statement), based on the following criteria:

Score ≥ 90 : Grade is 'A'; $70 \leq \text{Score} < 90$: Grade is 'B';

$50 \leq \text{Score} < 70$: Grade is 'C'; $\text{Score} < 50$: Grade is 'D';

If $\text{Score} < 0$ or $\text{Score} > 100$ the script displays an error message 'Incorrect Score'.

2. Write a Matlab script that takes an integer n and a real x as inputs and outputs the sum S :

$$S = x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + \dots + \frac{x^n}{n}.$$

3. Write a Matlab script that calculates an approximation of π , by using the Gregory-Leibniz series for $N = 10^7$:

$$\frac{\pi}{4} \simeq \sum_{k=0}^N \frac{(-1)^k}{2k+1}.$$

Exercise 03: (06pts)

1. Write the square matrix **A** of order 4 containing integers from 5 to 20 arranged by line.
2. Extract from this matrix the following sub-matrices:
B: the sub-matrix formed by the coefficients a_{ij} for $1 < i < 4$ and $j = 1, 2, 4$.
C: the sub-matrix formed by the coefficients a_{ij} for $(i; j) \in \{2, 4\}^2$.
3. What are the results of the following commands: **A' + A**, **A/A(1,end-1)**, **A*eye(4)**,
A.*ones(4,2), **C*B**, **B*C**.
4. What is the command that extracts the first column from **A**?
5. What is the command that deletes the last line of **A**?

Exercise 04: (04pts)

Let f and g be two functions defined by: $f(x) = \sin\left(\frac{\pi}{4}x\right)$ and $g(x) = \cos\left(\frac{\pi}{4}x\right)$.

Write a Matlab script to:

1. Create a vector x of 150 points, with values ranging from 0 to 4π .
2. Plot f and g in the same figure in two different ways. Plot the curve of f in solid red line and the curve of g in dashed green line.
3. Add title and legends to the figure.