

**Final Exam**  
**Programming Tools for Mathematics**

**Exercise 01:** (03pts) The results of commands:

$3 \setminus 6 * 4 + 2^3$  , ans = 16 ...(0.25 pts)       $\text{sqrt}(-9)$  , ans = 3i ...(0.25 pts)  
 $\text{conj}(4 * i - 3)$  , ans = -3-4\*i ...(0.25 pts)       $\log_2(4) + 3$  , ans = 5 ...(0.25 pts)  
 $0/0$ , ans = NaN.(0.25 pts)  $2 * \ln(1) + 3$ , Error: Undefined function or variable 'ln'.(0.5 pts)  
 $(1 + 2 \leq 3)$  , ans = 1..(0.25 pts)  $\text{syms } x, \text{eq} = x^2 + 1, \text{solve}(\text{eq})$  , ans = 2i -2i ..(01 pts)

**Exercise 02:** (07pts)

1. A Matlab script that takes a student's score as input and outputs their grade classification:

```
score=input('Enter the score : ')
switch true
case score <= 100 && score >= 90
disp('Grade is A')
case score >= 70 && score <90
disp('Grade is B')
case score >= 50 && score <70
disp('Grade is C')
case score >= 0 && score <50
disp('Grade is D')
otherwise
error('Incorrect Score')
end
```

...(03pts)

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

```
x=input('Enter a real x : ')
n=input('Enter an integer n : ')
S = 0;
for k = 1:2:n
S = S + (x^k)/k;
end
disp(S)
```

...(02pts)

3. A Matlab script that calculates an approximation of  $\pi$ , by using the Gregory-Leibniz series:

```
N=10^7;
pi_approx = 0;
for k = 0 : N
pi_approx = pi_approx + ((-1)^k)/(2*k + 1);
end
pi_approx = pi_approx * 4
```

...(02pts)

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### **Exercise 03: (06pts)**

A = reshape(5:20, [4 4])'; ...(01pts)

B = A(2:3, [1 2 4]); ...(0,5pts)

C = A([2 4], [2 4]); ...(0,5pts)

$$A' + A = \begin{pmatrix} 10 & 15 & 20 & 25 \\ 15 & 20 & 25 & 30 \\ 20 & 25 & 30 & 35 \\ 25 & 30 & 35 & 40 \end{pmatrix} ..(0.75pts); \quad A/A(1, end-1) = \begin{pmatrix} 5/7 & 6/7 & 1 & 8/7 \\ 9/7 & 10/7 & 11/7 & 12/7 \\ 13/7 & 2 & 15/7 & 16/7 \\ 17/7 & 18/7 & 19/7 & 20/7 \end{pmatrix} ... (0, 75pts)$$

$$A * eye(4) = A = \begin{pmatrix} 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \\ 17 & 18 & 19 & 20 \end{pmatrix} ..(0.5pts); \quad C * B = \begin{pmatrix} 246 & 268 & 312 \\ 422 & 460 & 536 \end{pmatrix} ..(01pts)$$

A .\* ones(4, 2) , Error: Inner matrix dimensions must agree. ...(0,25pts)

B \* C , Error: Inner matrix dimensions must agree. ...(0,25pts)

first\_column\_A = A(:, 1); ...(0,25pts)

A(end, :) = []; ...(0,25pts)

### **Exercise 04: (04pts)**

% Create a vector x with 150 points ranging from 0 to 4\*pi  
**x = linspace(0, 4\*pi, 150);** ...(01pts)

% Define the functions f(x) and g(x)  
**f = sin(pi/4 \* x);** ...(0,5pts)  
**g = cos(pi/4 \* x);** ...(0,5pts)

% Plot f(x) and g(x) in the same figure; Plot f(x) in solid red line and g(x) in dashed green line  
**figure; plot(x, f, 'r-', x, g, 'g--');** ...(01pts)

% Add title and legends  
**title('Plot of f(x) and g(x)');** ...(0,5pts)  
**legend('f(x) = sin(pi/4 \* x)', 'g(x) = cos(pi/4 \* x)');** ...(0,5pts)