

# E7 Midterm Examination 1

September 28, 2018

NAME : \_\_\_\_\_

SID : \_\_\_\_\_

Part	Points	Grade
A	8	
B	5	
C	3	
D	5	
E	6	
F	5	
G	5	
H	6	
I	5	
<b>TOTAL</b>	<b>48</b>	

- Notes:
1. Write your full name and SID in the spaces provided above.
  2. Write your name on the top right corner of each page.
  3. Record your answers *only in the spaces provided*.
  4. This is a closed-book exam.
  4. You may *not* ask questions during the exam.
  5. You may *not* leave the exam room before the exam ends.
  6. You may *not* use any electronic devices (cell phones, computers) during the exam.

**Part A** (8 points)

Let the MATLAB arrays A, B, and C be defined as

```
>> A = [1 2 3 4; 5 6 7 8; 9 10 11 12];  
>> B = 10:-1:1;  
>> C = [1 1; 2 2];
```

Record the output of the following MATLAB commands:

A.1 (1 point)

```
>> A(2:4)
```

```
ans = _____
```

A.2 (1 point)

```
> A(A(1,2), A(1,3))
```

```
ans = _____
```

B.3 (1 point)

```
> A([2,3], [2,4])'
```

```
ans = _____
```

A.4 (1 point)

```
> A(:,2)
```

```
ans = _____
```

A.5 (1 point)

```
>> A(B(1:2), B(1:2))
```

```
ans = _____
```

A.6 (1 point)

```
> A(1:4).^C(1:4)
```

```
ans = _____
```

A.7 (1 point)

&gt;&gt; eye(2,2) .\* C

ans = \_\_\_\_\_

A.8 (1 point)

&gt;&gt; [A(:,1); 1]'

ans = \_\_\_\_\_

**Part B** (5 points)

Answer the following questions about polynomials and their representation in MATLAB.

B.1 (1 point) How do you represent  $p_1(x) = x^3 + 2x - 3$  in MATLAB?

&gt;&gt; p1 = \_\_\_\_\_

B.2 (1 point) What should `polyval(p1, 1)` evaluate to?

ans = \_\_\_\_\_

B.3 (2 points) Write the command that would add  $p_2 = [5, 0, 0, 1, 2]$  to  $p_1$  and record the answer.

&gt;&gt; \_\_\_\_\_

ans = \_\_\_\_\_

B.4 (1 point) Write a one line statement that evaluates to true if a polynomial  $p$  has only even components.

&gt; \_\_\_\_\_

**Part C** (3 points)

In the English language, there are a few simple sentences that contain all letters in the alphabet. For instance, consider the character string `cypher1`, defined in MATLAB as

```
>> cypher1 = 'THE QUICK FOX JUMPS OVER THE LAZY BROWN DOG'
```

This allows us to pair up letters and numbers and write coded messages. Each letter in the cypher character string can be given a numerical value corresponding to its position in the sentence, that is, we assign the letter 'T' to 1, the letter 'H' to 2, and so on. In that context, answer the following questions:

C.1 (1 point) Given a secret code `code = [35, 3, 24, 9, 23, 30, 28, 33]`, how would you access the message from `cypher1`?

```
>> _____
```

C.2 (1 point) What does the message in part C.1 spell?

```
>> ans = _____
```

C.3 (1 point) What code would result in the message 'GO BEARS'?

```
>> _____
```

**Part D** (5 points)

Record the output of the following MATLAB commands by completing every blank output line.

## D.1 (1 point)

```
>> A = {[true, false], ones(2,2); 'EASY QUESTION', ...  
        [2 4; 6 8; 10 12]};
```

```
>> class(A(2,1))
```

```
ans = _____
```

## D.2 (1 point)

```
>> class(A{1,1})
```

```
ans = _____
```

## D.3 (1 point)

```
>> size(A(1,2))
```

```
ans = _____
```

## D.4 (1 point)

```
>> size(A{4})
```

```
ans = _____
```

## D.5 (1 point)

```
>> A{2,2}(1,2)+A{1,2}(2,2)
```

```
ans = _____
```

**Part E** (6 points)

Let a structure array be defined as follows:

```
>> s(1).subject = 'Math';  
>> s(1).grade = 84;  
>> s(2).subject = 'Physics';  
>> s(2).grade = 90;  
>> s(3).subject = 'Chemistry';  
>> s(3).grade = 75;
```

Record the output of the following MATLAB commands.

E.1 (1 point)

```
>> class(s)
```

ans = \_\_\_\_\_

E.2 (1 point)

```
>> size(s)
```

ans = \_\_\_\_\_

E.3 (1 point)

```
>> class(s(2).subject)
```

ans = \_\_\_\_\_

E.4 (1 point)

```
>> length(s(2).subject)
```

ans = \_\_\_\_\_

E.5 (1 point)

```
>> g = [s(1).grade s(2).grade s(3).grade];  
>> mean(g)
```

```
ans = _____
```

E.6 (1 point) Write a MATLAB command to change the 'Chemistry' score to 78.

```
>> _____
```

**Part F** (5 points)

Consider the following MATLAB code segment:

```
>> x = 1.234;  
>> y = 2.345;  
>> a = 0:4;  
>> b = a.^2;
```

Record the output of the following MATLAB commands.

F.1 (1 point)

```
>> x>=y
```

ans = \_\_\_\_\_

F.2 (1 point)

```
>> a==2
```

ans = \_\_\_\_\_

F.3 (1 point)

```
>> find(a==2)
```

ans = \_\_\_\_\_

F.4 (1 point)

```
>> x~=x
```

ans = \_\_\_\_\_

F.5 (1 point)

```
>> sum(a==b | a>3)
```

ans = \_\_\_\_\_

**Part G** (5 points)

Consider the following function, called `openinghours`, which, for a given day of the week and time, returns `true` if a store is open or `false` if it is closed.

```
function isopen = openinghours( weekday, time )
    if weekday=='Mon' | weekday=='Wed' | weekday=='Fri'
        if time < 8 || 12 < time
            isopen = false;
        else
            isopen = true;
        end
    elseif weekday=='Tue' | weekday=='Thu'
        if time < 10 || 12 < time
            isopen = false;
        else
            isopen = true;
        end
    else
        isopen = false;
    end
end
```

Record the output of the following MATLAB calls to the function.

## G.1 (1 point)

```
>> openinghours('Mon',9)
```

```
ans = _____
```

## G.2 (1 point)

```
>> openinghours('mon',9)
```

```
ans = _____
```

## G.3 (1 point)

```
>> openinghours('Tue',9)
```

```
ans = _____
```

G.4 (1 point)

```
>> openinghours('Tue',11)
```

ans = \_\_\_\_\_

G.5 (1 point)

```
>> openinghours('Sat',11)
```

ans = \_\_\_\_\_

**Part H** (6 points)

A MATLAB m-file contains the following code:

```
function y = func1(x)
% A composite function
y = func2 + func4 + func5(2,x)
function y = func2
    func3;
    y = x*x;
function func3
    x = x+1;
end
end
function w = func4
    w = 3*x;
end
end
function z = func5(x,y)
    z = x*(y-1);
end
```

H.1 (1 point) What is the name of the main function in this code?

Answer: \_\_\_\_\_

H.2 (1 point) Which functions in this code are nested?

Answer: \_\_\_\_\_

H.3 (1 point) Which functions in this code are subfunctions?

Answer: \_\_\_\_\_

H.4 (2 points) What would be the output of the command

```
>> func1(3)
```

in the command window?

ans = \_\_\_\_\_

H.5 (1 point) What would be the output of the command

```
>> func5(1,2)
```

in the command window?

ans = \_\_\_\_\_

**Part I** (5 points)

Write the output of the MATLAB commands below:

## I.1 (1 point)

```
>> f1 = @(x,y) x/y + y/x;  
>> f1(1,1)
```

ans = \_\_\_\_\_

## I.2 (3 points)

```
>> a = 1; b = 2;  
>> f2 = @(x) a*x + b;  
>> f2(3)
```

ans = \_\_\_\_\_

```
>> feval(f2, [1 2])
```

ans = \_\_\_\_\_

```
>> a = 5;  
>> f2(4)
```

ans = \_\_\_\_\_

## I.3 (1 point)

```
>> f3 = @(x) 2^abs(x) + 1;  
>> f3(f3(-1))
```

ans = \_\_\_\_\_