

EE 3054: Signals, Systems, and Transforms

MATLAB Quiz — Fall 2007

No laptop, no notes, no documentation.

Some MATLAB commands on this quiz may produce errors. For those cases, please state that.

1. Given the following arrays,

```
x = [3 1 2];  
y = [4 2 7];  
A = [5 2 1; 8 0 2];
```

determine the result of each of the following commands. If the command will not correctly execute, state why it will not.

```
>> x(2,1)  
>> y'  
>> A([2 1], [1 2])  
>> x + y  
>> x + A  
>> x + y'  
>> A - [x; y]  
>> A > 3  
>> A(:)  
>> x + min(y)  
>> x * y  
>> x .* y  
>> B = A; B(1:2,2) = [-5; -10]; B  
>> C = A; C(1,:) = x; C  
>> x * A  
>> x * A'
```

2. What are the results of the following commands?

```
x = [3 10 -23 -9 5 30];  
k = find(x < 5);  
x(k) = 0;  
k  
x
```

3. The following code fragment produces 3 graphs. Sketch each of the three graphs.

```
>> n = 0:2:6;  
>> x = [2 0 1 1];  
>> y = [1 3 2 1];  
>> z = conv(x,y);  
>> stem(x)  
>> stem(n,y)  
>> stem(z)
```

4. Write a MATLAB function called `mysum` to evaluate the following summation

$$\sum_{n=1}^N \frac{(-1)^{n+1}}{n^2 + 1}$$

The function has one input and one output. The input is the upper limit of summation (i.e. N). The output is the sum of N values. For example,

```
>> y = mysum(3)
```

y =

0.4000

because $\frac{1}{2} - \frac{1}{5} + \frac{1}{10} = \frac{2}{5}$.

Your program should NOT use a `for` or `while` loop and it should not use an `if` statement.

5. Write a MATLAB function called `mymatrix` that has two inputs and one output. (That means, write the contents of the file `mymatrix.m`.) Each of the two inputs is an integer; the output is an $N \times N$ matrix. Your program should produce the following square matrix,

$$\begin{bmatrix} 0 & 0 & \cdots & & 0 \\ 0 & 0 & \cdots & & 0 \\ \vdots & \vdots & \cdots & & \vdots \\ 0 & 0 & \cdots & & 0 \\ 0 & 0 & \cdots & 0 & \begin{bmatrix} 1 & 1 & \cdots & 1 \end{bmatrix} \\ 0 & 0 & \cdots & 0 & \begin{bmatrix} 1 & 1 & \cdots & 1 \end{bmatrix} \\ \vdots & \vdots & & \vdots & \begin{bmatrix} \vdots & \vdots & \ddots & \vdots \end{bmatrix} \\ 0 & 0 & \cdots & 0 & \begin{bmatrix} 1 & 1 & \cdots & 1 \end{bmatrix} \end{bmatrix}_{M \times M} \Big]_{N \times N}$$

The first input is the size of the output matrix (i.e. N), while the second input is the size of the submatrix (i.e. M). For example,

```
>> y = mymatrix(5, 3)
```

y =

```

0     0     0     0     0
0     0     0     0     0
0     0     1     1     1
0     0     1     1     1
0     0     1     1     1
```

because the size of the output matrix is 5×5 , and the size of the submatrix is 3×3 . Your program should NOT use a `for` or `while` loop and it should not use an `if` statement.

6. The diagrams on the following page are generated by the code fragments below. However, they are out of order. Match each diagram by filling out the following table. (Copy the table into your answer book.)

Code Fragment	Diagram
1	
2	
3	
4	
5	

Code Fragment (1):

```
t = [0:8]*pi/8;
plot(cos(t),sin(t));
axis([-1 1 -1 1]*1.2);
axis equal
```

Code Fragment (2):

```
t = [0:8]*pi/8;
plot(cos(t),sin(t),'*');
axis([-1 1 -1 1]*1.2);
axis equal
```

Code Fragment (3):

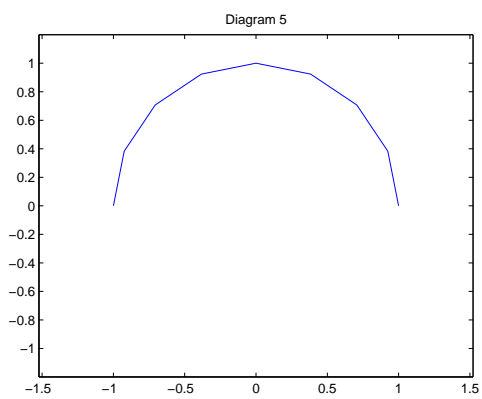
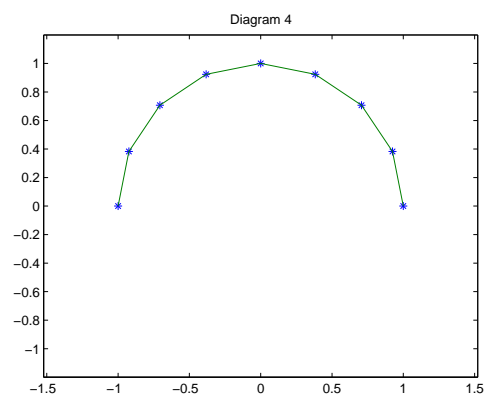
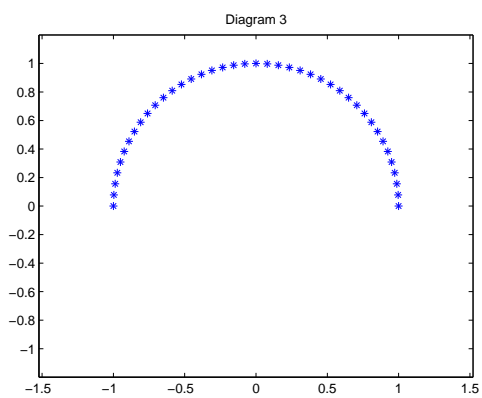
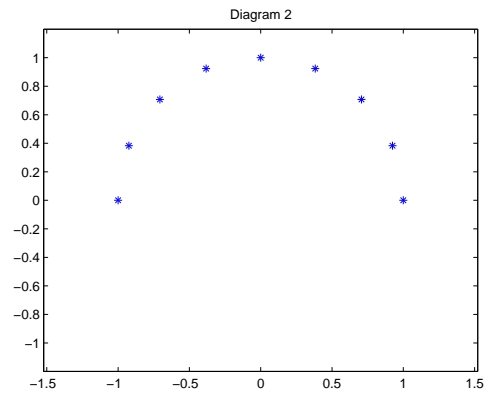
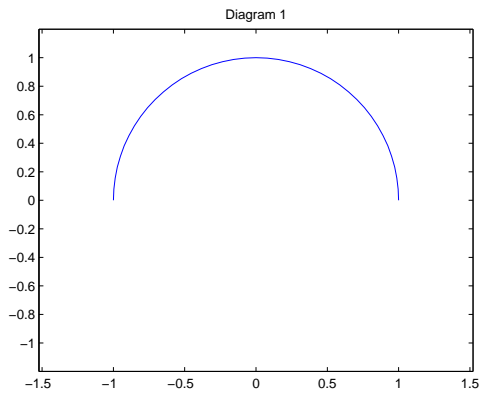
```
t = [0:0.2:8]*pi/8;
plot(cos(t),sin(t));
axis([-1 1 -1 1]*1.2);
axis equal
```

Code Fragment (4):

```
t = [0:0.2:8]*pi/8;
plot(cos(t),sin(t),'*');
axis([-1 1 -1 1]*1.2);
axis equal
```

Code Fragment (5):

```
t = [0:8]*pi/8;  
plot(cos(t),sin(t),'*',cos(t),sin(t));  
axis([-1 1 -1 1]*1.2);  
axis equal
```



7. The time function over an interval $0 < t < T$ is given and illustrated below

$$x(t) = \frac{E_1 + E_2}{T_1} t - E_2; \quad 0 < t < T_1$$
$$= -E_2; \quad T_1 \leq t < T$$

Write a MATLAB code fragment to make a plot of the following figure, including axis labels and title. You should NOT use a `for` or `while` loop and you should NOT use an `if` statement.

