

**ECE 1010-002 Midterm October 21, 1997 Name:**

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1.) You are in the MATLAB command window and type the following commands without the trailing semicolon. Write out what will appear on the screen.

4 pts. a.) `A = zeros(2,3)`  
» `A = zeros(2,3)`

A =

```
    0    0    0
    0    0    0
```

4 pts. b.) `B = [1, 3; 4, 6; 7, 9]`  
» `B = [1, 3; 4, 6; 7, 9]`

B =

```
    1    3
    4    6
    7    9
```

4 pts. c.) `C = eye(4)`  
» `C = eye(4)`

C =

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

4 pts. d.) `D = 0:.5:4`  
» `D = 0:.5:4`

D =

Columns 1 through 7

```
    0    0.5000    1.0000    1.5000    2.0000    2.5000    3.0000
```

Columns 8 through 9

```
    3.5000    4.0000
```

4 pts. e.) `E = zeros(B)`

» `E = zeros(B)`

??? Error using ==> zeros

Size vector must be a row vector with integer elements.

%%% My error, should have been:

» `E = zeros(size(B))`

E =

```
    0    0
    0    0
    0    0
```

2.) Given the following arrays:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}, B = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \end{bmatrix}$$

What is the result of the following operations?

4 pts.    » A = [1 2 3; 4 5 6]; B = [9 8 7; 6 5 4];  
 a.) C = A - B  
 » C = A - B

C =

$$\begin{array}{ccc} -8 & -6 & -4 \\ -2 & 0 & 2 \end{array}$$

4 pts.    b.) D = A .\* B  
 » D = A .\* B

D =

$$\begin{array}{ccc} 9 & 16 & 21 \\ 24 & 25 & 24 \end{array}$$

4 pts.    c.) E = A ./ B  
 » E = A ./ B

E =

$$\begin{array}{ccc} 0.1111 & 0.2500 & 0.4286 \\ 0.6667 & 1.0000 & 1.5000 \end{array}$$

4 pts.    d.) F = A.^2  
 » F = A.^2

F =

$$\begin{array}{ccc} 1 & 4 & 9 \\ 16 & 25 & 36 \end{array}$$

4 pts.    e.) G = B/3  
 » G = B/3

G =

$$\begin{array}{ccc} 3.0000 & 2.6667 & 2.3333 \\ 2.0000 & 1.6667 & 1.3333 \end{array}$$

5 pts. 3.) What output is produced by the following statements?

```
x = 0:4;
y = x.^2;
[x' y'];
```

```
» [x' y']; % Error; to get a display need to remove the semicolon.
» [x' y']
```

ans =

```
0     0
1     1
2     4
3     9
4    16
```

4.) Consider the MATLAB function file listed below:

```
function y = problem4(x,a)
%       y = problem4(x,a)
%
y = zeros(x); %%% should have been>> y = zeros(size(x));
set1 = find(x >= 0);
y(set1) = a*x(set1); %%Remove ';' so set1 will display
% End of the function file
```

The input to this function is:

```
x = [-4 0 3];
y = problem4(x,5);
```

5 pts. a.) When the function executes what does set1 contain?

```
» x = [-4 0 3];
» y = problem4(x,5)
```

set1 =

```
2     3
```

y =

```
0     0    15
```

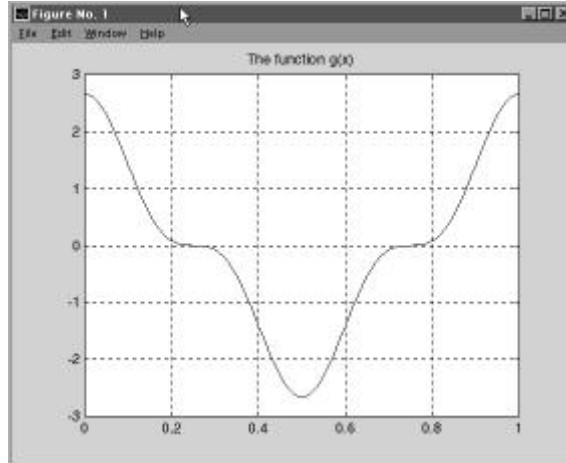
5 pts. b.) What are the contents of vector y upon returning from the function call?

- See the above

10 pts. 5.) We would like to obtain a plot of the function

$$y = g(x) = 2\cos(2\pi x) + \frac{2}{3}\cos(6\pi x)$$

for  $0 \leq x \leq 1$  (error should have been  $0 \leq x \leq 1$ ) using a step size of 0.01 on the  $x$ -axis. The MATLAB plot should appear as follows



Provide the MATLAB command listing to produce the above plot, starting with the generation of the  $x$  vector.

```

» x = 0:0.01:1;
» y = 2*cos(2*pi*x) + 2/3*cos(6*pi*x);
» plot(x,y);
» grid
» title('The function g(x)')

```

4 pts. 6.) Explain the difference between  $\text{atan}(y/x)$  and  $\text{atan2}(y,x)$

- The function  $\text{atan}(y/x)$  will return the angle associated with the vector  $(x,y)$  properly only within the quadrants I and IV
- The function  $\text{atan2}(y,x)$  will return the angle in the proper quadrant no matter where it lies, i.e., quadrants I, II, III, or IV

7.) What result does the following MATLAB code produce

```
x = [0, 4, 3, -5, 6, -9];
4 pts. a.) y = mean(x)
» y = mean(x)
```

```
y = -0.1667 %This is the sum/6
```

```
4 pts. b.) y = min(x)
» y = min(x)
```

```
y = -9 %This is simply the smallest value
```

```
4 pts. c.) y = find(x > 3 & x <=6)
» y = find(x > 3 & x <= 6)
```

```
y = 2 5 %The indices of the elements > 3 and <= 6
```

8.) Assuming the following matrices as in the MATLAB workspace

$$A = \begin{bmatrix} 1 & 2 \\ 4 & -2 \end{bmatrix}, B = \begin{bmatrix} 5 & 1 & 0 \\ 0 & -1 & 7 \end{bmatrix}, C = \begin{bmatrix} 8 & 2 & -3 \end{bmatrix}$$

Compute the response to the following MATLAB command inputs

```
» A = [1 2; 4 -2]; B = [5 1 0; 0 -1 7]; C = [8 2 -3];
5 pts. a.) D = C*C'
» D = C*C'
```

```
D = 77
```

```
5 pts. b.) F = A*B
» F = A*B
```

```
F =
    5    -1    14
   20     6   -14
```

```
5 pts. c.) H = B'
» H = B'
```

```
H =
    5     0
    1    -1
    0     7
```

```
4 pts. d.) Does  $A^{-1}$  exist? Justify your answer.
» det(A)
```

```
ans = -10 % Since nonzero, inverse must exist
```

```
» inv(A)
```

```
ans =
```

```
    0.2000    0.2000
    0.4000   -0.1000
```