E7 Midterm Examination 1
Friday October 10, 2008

Name: 

SID: 

Lecture Section:  

(please circle your lecture section)

Lab Section: (please circle your laboratory section)

11 – TuTh 8-10  
12 – TuTh 10-12  
13 – TuTh 12-2  
14 – TuTh 2-4

15 – TuTh 4-6  
16 – MW 8-10  
17 – MW 10-12  
18 – MW2-4

19 – MW 4-6  
20 – MW 2-4 (2109)  
21 – TuTh 10-12 (2109)

22 – TuTh 12-2 (2109)  
23 – TuTh 2-4 (2109)  
24 – TuTh 4-6 (2109)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Points</th>
<th>Grade</th>
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<td>1</td>
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<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
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1. Write your name on each page.
2. Write your answers ONLY on the spaces provided.
3. You may not ask questions during the examination, nor leave the room before the exam ends.
5. No calculators, no cell phones, no food or drink. Please turn cell phones off.
1. Suppose the following statements are executed.

\[ A = [1 \ 4 \ 3 \ 8]; \]
\[ B = [0 \ 3 \ 5 \ ; \ 1 \ 4 \ 2]; \]

Write the results of the following commands. Write “Error” if an error is produced.

(a) \[ A(\text{end}:-2:1) \]

(b) \[ B(5) \]

(c) \[ B(3,2) \]

d) \[ B([2 \ 1],[3 \ 1]) \]

(e) \[ B(:,2)' \ .^2 + A([3 \ 4]) \ ./ \ A([1 \ 2]) \]
2. Suppose the following statements are executed.

\[
\begin{align*}
& \gg A = [1 \ 4 \ 2 \ 6] ; \\
& \gg B = [2 \ 3 \ \overline{-1} \ 6] ; \\
\end{align*}
\]

Write the results of the following commands. Write "Error" if an error is produced.

(a) \( \gg \sim (A==B) \mid (A==B) \)

(b) \( \gg A([1, 3]) > B(2:3) \)

(c) \( \gg \text{find}(A==B) \)

(d) \( \gg \text{find} \left( (A==B) \ & \ (A<(B*2)) \right) \)
3. Assume that the following MATLAB command has been executed to create the 2x2 cell array named Mycell

\[
\text{>> Mycell} = \{\text{'Good'}, \{\text{'Morning'}, 5, \text{'Sunshine'}\}\}; \\
\quad [3;7], [1 \ 5 \ ; \ 2 \ 4]\]
\]

<table>
<thead>
<tr>
<th>'Good'</th>
<th>{ 'Morning', 5, 'Sunshine'}</th>
</tr>
</thead>
</table>
| \[
| 3 |
| 7 |
| \] | \[
| 1 5 |
| 2 4 |
| \] |

Pictorial diagram of Mycell

(a) Write the results of the following commands. Write “Error” if an error is produced.

(1) \text{>> class(Mycell(1,1))}

(2) \text{>> class(Mycell{1,1})}

(3) \text{>> class(Mycell{1,2})}

(4) \text{>> Mycell{1,1}(2)}

(5) \text{>> Mycell{1,2}{2}}

(continues on next page)
<table>
<thead>
<tr>
<th>'Good'</th>
<th>{'Morning', 5, 'Sunshine'}</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3]</td>
<td>[1 5]</td>
</tr>
<tr>
<td>[7]</td>
<td>[2 4]</td>
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</table>

Pictorial diagram of Mycell

(b) Write a one-line MATLAB command to create a character array that contains 'Good Morning Sunshine' from the contents of Mycell.

>>

(c) Write a one-line MATLAB command that will add a third row of ones to the array contained in the (2,2) element of Mycell

>>
4. The following MATLAB commands are executed to obtain the structure array Teamdata:

```matlab
>> Teamdata(1).Team = 'Super'
>> Teamdata(1).Timing = [102, 107]
>> Teamdata(2).Team = 'Fantastic'
>> Teamdata(2).Timing = [100, 101, 99]
```

Write the results of the following commands. Write ‘Error’ if an error is produced.

(a) `size(Teamdata)`

(b) `class(Teamdata(2).Team)`

(c) `Teamdata(1).Team(end:-2:1)`

(d) `s = [ Teamdata.Team ]`

(e) `s(7)`

(f) `Teamdata(1).Timing(2)`
5. (a) Given a rectangle pictured below, write a function called `rectangle`, which calculates its area and perimeter length. This function should have \( a \) and \( b \) as its input arguments and return output arguments area and perimeter.

![Rectangle Diagram](image)

M-file `rectangle.m`

(b) Create an anonymous function that computes and returns the sum of the squares of two scalar input arguments of class double.

```matlab
>>
```
6. Given the function `my_funct` shown below

```matlab
function y = my_funct(x)
    if x <= 5
        y = x + 2;
    elseif x < 12
        y = x - 2;
    else
        y = x / 2;
    end
```

write the results of the following commands. Write “Error” if an error is produced.

(a) `>> my_funct(3)`

(b) `>> my_funct(10)`

(c) `>> my_funct(26)`
7. (a) The function `min_dist` shown below determines the minimum value of

\[ D(x) = \sqrt{f(x)^2 + x^2} \]

in the range \( a < x < b \)

where \( f(x) \) is a user-defined function. `min_dist` utilizes the MATLAB function `fminbnd` (see syntax below)\(^1\).

Complete the incomplete line of code in function `min_dist`.

```matlab
function D = min_dist(fh,a,b)
    % fh is the handle to a single-valued vectorized function
    % a < x < b
    Dh =
    [xmin, D] = fminbnd(Dh,a,b);
```

(b) Write a command that uses the function `min_dist` to compute the minimum value of \( D(x) \) defined above, when \( a = -3, b = 3 \), and the function \( f(x) \) is defined by the vectorized function `my_fun`, which is stored in the M-file `my_fun.m`.

```matlab
>> [xmin, fmin] = fminbnd(fh,a,b)
```

---

\(^1\) `[xmin, fmin] = fminbnd(fh,a,b)`

`xmin` is a minimizer of a single-valued **vectorized** function with handle `fh` in the interval \( a < x < b \).

`fmin = fh(xmin)`. `fh` is a function handle.