University of California, Berkeley
Fall Semester 2005

College of Engineering
Professor R. Dibble and R. Horowitz

E77 Midterm Examination II

Wednesday October 26, 2005

Name :	
SID :	

Section: **1** **2** (Please circle your lecture section)

Please circle your Laboratory section: (where your exam will be returned)

#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: MW 2-4 #19: MW 4-6

Part	Points	Grade
1	10	
2	6	
3	6	
4	8	
5	10	
6	10	
7	12	
8	10	
9	6	
10	12	
TOTAL	90	

1. Write your name on each page.
2. Record your answers <u>ONLY</u> on the spaces provided.
3. You may <u>not</u> ask questions during the examination. You may <u>not</u> leave the room before the exam ends.
4. Close book exam. Two 8.5" × 11" sheets (4 pages) of handwritten notes allowed.
5. No calculators or cell phones allowed. (Please turn cell phones off)

1 Part

Assume that the following commands have been entered in the Matlab command window:

```
>> clear

>> test(1).A = 4;
>> test(1).B = [1, 2];
>> test(2).A = 6;
>> test(2).B = [4, 5];

>> pad = [1, 2, 3;...
          4, 5, 6;...
          7, 8, 9];

>> primes = [2, 3, 5, 7, 11, 13];
```

Write down the output of the following commands:

(2) 1. `>> primes(test(1).A)`

`ans =` ______________________

(2) 2. `>> primes([test.A])`

`ans =` ______________________

(3) 3. `>> pad([test.A])`

`ans =` ______________________

(3) 4. `>> pad(1:2,2)=test(2).B'`

`pad =` ______________________

2 Part

Assume that the following Matlab statements have been executed

```
>> clear all
>>A = [-1 0 3];
>>B = [0 0 1];
>>C = [1 1 0];
```

Write the output after the following statements are executed:

(2) 1. `>> (C & A) | B`

ans= ______________________________

(2) 2. `>> (C | A) & B`

ans= ______________________________

(2) 3. `>> C(A>B)`

ans= ______________________________

3 Part

Below are two 7-line blocks of code. Given a scalar value for the variable `x`, each code assigns a corresponding scalar value to the variable `y`.

Code 1		**Code 2**

`if x < 5`
`    y = 2* x;`
`elseif x < 10`
`    y = x;`
`else`
`    y = 10;`
`end`
		`if x < 10`
		`    y = x;`
		`elseif x < 5`
		`    y = 2* x;`
		`else`
		`    y = 10;`
		`end`

These two blocks of code do not produce the same results for all values of `x`.

(3) 1. Determine a value of `x` for which the two codes produce the same value of y.

x = ____________________

(3) 2. Determine a value of `x` for which the two codes will not produce the same value of y.

x = ____________________

4 Part

(8) Write a function called `find_num`, which has the following syntax and properties:

Syntax: `n = find_num(A,b)`

- If `A` is a vector or a matrix and `b` is a scalar, `find_num(A,b)` returns the number of elements of `A` that are equal to `b`.
- For example,

```
>> find_num([3 7 9; 1 2 7],7)
ans = 2
```

When writing your function, you must comply with the following instructions:

(i) The function must have at most 4 lines of code, including the function declaration (it is not acceptable to concatenate multiple lines of code, using several `;`'s or `,`'s).

(ii) You must use the `sum` function, which is described in the bottom section of this page.

Answer:

```
function n = find_num(A,b)
```

____

____

____

The function `sum` has the following syntax and properties:

Syntax: `n = sum(A)`

- If `A` is either a row or a column vector, `sum(A)` returns the sum of the elements of `A`.
- If `A` is a matrix, `sum(A)` treats the columns of `A` as vectors, returning a row vector of the sums of each column.
- For example,

```
>> sum([3 7 9; 1 2 7])
ans = 4     9    16
```

```
>> sum([ 1 ; 2 ; 3])
ans = 6
```

5 Part

Consider the following function `test`:

```
function g = test(a,b)
while b ~=0
    r = rem(a,b);
    a=b;
    b=r;
end
g = a;
```

Write the output of the following:

(5) 1. `>> test(36,40)`

`ans =` ______________________________

(5) 2. `>> test(test(15,5),3)`

`ans =` ______________________________

The function `rem` has the following syntax and properties:

Syntax: `R = rem(X,Y)`

- `rem(X,Y)` returns the remainder after the division of `X` by `Y`.
- Examples:

```
>> rem(3,2)            >> rem(2,3)
ans = 1                ans = 2

>> rem(2,0)            >> rem(4,2)
ans = NaN              ans = 0
```

6 Part

Write the output after running the following scripts.

(3) 1.

```
a=0;
for k= 7:5,
   a=a+k;
end
a
```

ans= ____________________

(3) 2.

```
a=0;
for k= 7:-1:5,
   a=a+k;
end
a
```

ans= ____________________

(4) 3.

```
A=[4 5;7 6];
B = zeros(2,2);

for k=1:2,
       for m = 1:2,
           B(m,k) = A(k,m);
       end
end
B
```

ans= ____________________

7 Part

John, Bob, and Joe own lemonade stands. Each went to the same store, and made the following purchases to get inventories for their stands:

- John spent D_1 dollars and purchased:

S_1	pounds of sugar
L_1	pounds of lemons
W_1	gallons of water

- Bob spent D_2 dollars and purchased:

S_2	pounds of sugar
L_2	pounds of lemons
W_2	gallons of water

- Joe spent D_3 dollars and purchased:

S_3	pounds of sugar
L_3	pounds of lemons
W_3	gallons of water

(5) 1. Let x_1, x_2 and x_3 respectively denote the unit price per pound of sugar and lemons and gallon of water. Write the three equations that determine the amounts D_1, D_2 and D_3 respectively spent by John, Bob and Joe.

ANS:____

(2) 2. The 3 equations above can be written in matrix form:

$$A\,x = b\,,$$

where A is a 3×3 matrix, and x and b are the 3×1 vectors. Clearly identify all element of the matrix A, and the vector b.

$$A = \begin{bmatrix} \quad & \quad & \quad \\ & & \\ & & \end{bmatrix} \qquad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \qquad b = \begin{bmatrix} \quad \\ \\ \end{bmatrix}$$

(Continues on the next page)

(2) 3. Write a Matlab command that you would use to determine the vector `x`, which solves `A x = b`, assuming that the matrix `A` and the vector `b` have been defined.

>>____

(2) 4. Issue a one-line Matlab command that produces a logical true if the exact solution of the equation `A x = b` exists AND is unique, and false otherwise.

>>____