

Duke University
Edmund T. Pratt, Jr. School of Engineering

EGR 53L Spring 2005

Test I

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Name (please print) _____

In keeping with the Community Standard, I have neither provided nor received any assistance on this test. I understand if it is later determined that I gave or received assistance, I will be brought before the Undergraduate Judicial Board and, if found responsible for academic dishonesty or academic contempt, fail the class. I also understand that I am not allowed to speak to anyone except the instructor about any aspect of this test until the instructor announces it is allowed. I understand if it is later determined that I did speak to another person about the test before the instructor said it was allowed, I will be brought before the Undergraduate Judicial Board and, if found responsible for academic dishonesty or academic contempt, fail the class.

Signature: _____

Problem I: [15 pts.] Relational and Logical Operators

Given the following Matlab commands:

A = 1:5
B = 6:-2:-3

Show what each variable below will become. For purposes of earning partial credit in the event of an incorrect response, you may also choose to write a brief description of what is happening in each command.

(a) $C = (A+B) < 5$

(b) $D = A + (B < 5)$

(c) $E = ((A.*B) >= 5) \& (B < 0)$

(d) $F = \sim((A > 3) \mid \sim(B == 4 \mid B < 1))$

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Problem II: [20 pts.] Basic Programming

Given the following equation:

$$q = \sin(a) * \frac{\log_{10}(b) + \sqrt{cd}}{\pi^2}$$

where a , b , c , and d are 1x1 numerical matrices and a is in degrees, write a Matlab script that will follow the rules below:

- (1) The program should issue a statement that the function is invalid if b is 0, and in that case should not even calculate q .
- (2) The program should issue a statement that q will be complex if b is negative or if the product of c and d is negative (assuming non-zero b), but it should still calculate and display q .
- (3) In all other cases, the program should simply calculate and display q .

Hint: the easiest way to display the answer is to just not put a ; at the end of the line. The diary below gives examples of the cases above. Note that the values for a , b , c , and d are assumed to have been already entered.

```
>>a=1; b=0; c=3; d=4; GetQ
Cannot calculate when b is 0
```

```
>> a=1; b=-2; c=3; d=4; GetQ
Warning: calculation is complex
q =
    0.0067 + 0.0024i
```

```
>> a=1; b=2; c=-3; d=4; GetQ
Warning: calculation is complex
q =
    0.0005 + 0.0061i
```

```
>> a=1; b=2; c=3; d=4; GetQ
q =
    0.0067
```

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Problem III: [20 pts.] Matrix Creation and Manipulation

For each of the following sections, either write the Matlab command required or answer the questions. Note that for the coding, efficiency will matter.

(a) Create a 3x4 matrix named `mat` that contains random integers between with values distributed between 1 and 6.

(b) Starting from `mat`, create a new matrix named `OddCols` which contains only the odd numbered columns from `mat`. An example is given below:

$$\text{if } mat = \begin{bmatrix} 1 & 4 & 6 & 3 \\ 2 & 5 & 5 & 2 \\ 3 & 6 & 4 & 1 \end{bmatrix} \quad \text{then } OddCols = \begin{bmatrix} 1 & 6 \\ 2 & 5 \\ 3 & 4 \end{bmatrix}$$

(c) What are the results of the following commands? Describe each in words.

- 1) `mat2 = mat`
- 2) `mat2(4,4) = 6`
- 3) `mat3 = mat2(5,5)`

(d) Write a line of code that will convert the matrix from a 3x4 matrix into a 12x1 matrix by putting the columns, one after the other, underneath each other. This matrix should be called `OneCol` For example, using `mat` above, `OneCol` would be

`[1; 2; 3; 4; 5; 6; 6; 5; 4; 3; 2; 1]`

(e) Write a line of code that will calculate the sum of the squares of the values in `mat` and call it `DicePower`. For example, given the values in `mat` above, `DicePower` would be 182.

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Problem IV: [15 pts.] UNIX

For the first task below, assume that you have just logged into a UNIX station and just started a terminal window. For each successive line, assume the lines above it have already been completed.

- (a) Create a directory called **MyStuff** in your home directory

- (b) Change into your **MyStuff** directory - the rest of the commands below assume you are in your **MyStuff** directory.

- (c) Create a directory called **Recitations** in your **MyStuff** directory

- (d) Create a directory called **LabReportz** in your **MyStuff** directory

- (e) Copy all files from Dr. G's `~mrg/public/MFiles` directory into your **LabReportz** directory

- (f) Move all files that end in `.rec` from your **LabReportz** directory into your **Recitations** directory

- (g) Delete all files ending in `.old` from both directories using only one command

- (h) Rename your **LabReportz** directory to **LabReports**

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Problem V: [20 pts.] MATLAB Coding

You are going to write a program called `GoMath.m` that allows Matlab to understand rudimentary English commands for basic mathematics. Specifically, your code is going to ask for three things - a number, a phrase, and a number. The phrase should be either `plus`, `times`, or `minus`. Your program should determine which operation the user wants to perform and calculate a variable `MyOutput` based on that. If the user inputs a phrase that is not known, then the program should state `Phrase unknown`. A sample diary is shown below, and you can most likely fit your code to the right of the diary:

```
>> GoMath
Enter a number: 1
Enter a phrase: plus
Enter another number: 2
```

```
MyOutput =
    3
```

```
>> GoMath
Enter a number: 1
Enter a phrase: minus
Enter another number: 2
```

```
MyOutput =
   -1
```

```
>> GoMath
Enter a number: 1
Enter a phrase: times
Enter another number: 2
```

```
MyOutput =
    2
```

```
>> GoMath
Enter a number: 1
Enter a phrase: divided by
Enter another number: 2
Phrase unknown
```

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Problem VI: [10 pts.] L^AT_EX Processing

Assuming you have written a file named `MyFile.tex`, give the proper UNIX commands needed to:

(a) Process `MyFile.tex` using L^AT_EX to produce a `.dvi` file

(b) Preview the `MyFile.dvi` file

(c) Create a PostScript file named `MyPS.ps` from `MyFile.dvi`

(d) Preview the `MyPS.ps` file

(e) Send `MyPS.ps` to the printer