

ID: _____ Name: _____

Midterm Exam, 201?..??, Instructor: Ahmet Sacan

Sign the honor code below. **No credit will be given for the exam without a signed pledge.**

I have neither given nor received aid on this examination.
Signed: _____

There are 10 questions in this exam. Turn in Questions 1-7 before you start working on Questions 8-10. Submit your programs for Questions 8-10 on BBVista, in addition to turning in your paper exam. Sign off your submission before exiting the room.

Q1 (5 pts). *Indexing.* Let **A** be a square matrix with at least 3 rows. Write a single statement that will assign into **B**, the 6 elements located in the last 2 rows and last 3 columns of **A**. After your statement executes, **B** should become a 2x3 matrix. Do not use loops.

B = _____

Q2 (5 pts). *Linear Indexing.* If matrix **M** has 5 rows and 7 columns, **M(3,2)** can equivalently be expressed as **M(x)**. What is the value of **x**?

Q3 (5 pts). *Creating vectors.* Use colon operator “:” to create a vector **X** that has values [4 11 18 25 32]. Create another vector **Y** that has the same values, using the linspace function.

X = _____
Y = linspace (_____)

Q4 (5 pts). *Logical Indexing.* Let **M** be a matrix of any size. First construct a logical matrix **I** that has the same size as **M** and has true for even elements of **M**. Making use of **I**, change the even elements of **M** by dividing them with 2. Making use **I**, then change the odd elements of **M** by multiplying them with 2.

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I = _____
M = _____
M = _____

Q5 (5 pts). *Variable scope.* The function apple is as given below. Fill in the blanks in the output.

<pre>>> x = 5; y = 6; >> y = apple(x); >> a = 2; b = 3; >> b = apple (a); >> fprintf('x=%d y=%d a=%d b=%d\n', x,y,a,b); _____</pre>	<pre>function a = apple(b) b = b*3; a = b * 2;</pre>
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Q6 (10 pts). *Nested for loops.* Fill in the blanks in the outputs below.

<pre>>> x = []; >> for a = [3 5] >> for b = [2 4 8] >> x(end+1) = b; >> end >> x(end+1) = a; >> end >> disp (x) _____</pre>	<pre>>> x=0; disp(3 < x < 5) _____ >> disp (4>3 +1) _____</pre>
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Q7 (5 pts). *Binary numbers.* What is the decimal value of the binary number 10101 ?

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Q8 (20 pts). *Loops or vectorized code, strings.* Write a function **getfancyrectangle(R,C)** that takes the number of rows and columns and returns a string as a character matrix, containing a "fancy" rectangle filled with alternating '@' and '#' characters, as shown below.

```
>> getfancyrectangle(2,4)
ans =
@#@#
#@#@
>> getfancyrectangle(3,4)
ans =
@#@#
#@#@
@#@#
```

Q9 (20 pts). *Loops or vectorized code.* Write a function **baileypi(n)** that calculates an approximation to π using the following formula. Also fill in the blanks in the following output.

$$\pi \approx \sum_{k=0}^n \frac{1}{16^k} \left(\frac{4}{8k+1} - \frac{2}{8k+4} - \frac{1}{8k+5} - \frac{1}{8k+6} \right)$$

```
>> disp( baileypi(0) )
3.1333
>> disp( baileypi(1) )
3.1414
>> disp( baileypi(10) )
```
