

## Wk 1 Assignment

Due: Monday, Oct. 1, 11:59pm EST

**Objective:**The purpose of this assignment is to practice programming in MATLAB .

### Interactive MATLAB Tutorial

Go to [http://www.mathworks.com/academia/student\\_center/tutorials/register.html](http://www.mathworks.com/academia/student_center/tutorials/register.html) and register for a MathWorks account so you can access the MATLAB tutorials. Complete the two tutorials titled: “MATLAB On-Ramp (approximately 30 minutes)” and “MATLAB for Problem Solving (approximately 60 minutes)”.

### MATLAB Programming

**What to turn in:**In a single PDF file, submit your clearly labeled and commented MATLAB script, all supporting MATLAB functions you wrote, AND the outputs as displayed in the command window. In addition, place all the requested MATLAB script and functions in a separate zipped file and submit the zipped file with your single PDF file.

1. (5 pts)(By Darryl Morrell) Answer the following questions.

(a) What will the code shown in Algorithm 1 print?

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**Algorithm 1** Pseudocode for 1(a)

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```
p1 = 3.14;
p2 = 3.14159;
if p1 == p2 then
    disp('p1 and p2 are equal')
else
    disp('p1 and p2 are not equal')
end if
```

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(b) For what values of the variable a will the code shown in Algorithm 2 print ‘Hello world’?

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**Algorithm 2** Pseudocode for 1(b)

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```
if a < 3 || a > 10 then
    disp('Hello world')
else
    disp('Goodbye world')
end if
```

---

(c) For what values of the variable a will the code shown in Algorithm 3 print ‘Hello world’?

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**Algorithm 3** Pseudocode for 1(c)

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```
if a >= 0 && a < 7 then
    disp('Hello world')
else
    disp('Goodbye world')
end if
```

---

- (d) Write an if statement that will print “a is very close to zero” if the value of the variable a is between  $-0.01$  and  $0.01$ . Name your function `close2zero_user.m`. Replace `user` with your drexel.edu e-mail username. For example, for my two functions, I would name my functions `close2zero_mah349.m`

**2. (5 pts)**(By Darryl Morrell) Answer the following questions.

- (a) How many times will the code shown in Algorithm 4 loop print ‘Hello world’?

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**Algorithm 4** Pseudocode for 2(a)

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```
n = 10;
while n > 0 do
    disp('Hello World')
    n = n - 1;
end while
```

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- (b) How many times will the code shown in Algorithm 5 loop print ‘Hello world’?

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**Algorithm 5** Pseudocode for 2(b)

---

```
n = 1;
while n > 0 do
    disp('Hello World')
    n = n + 1;
end while
```

---

- (c) What values will the code shown in Algorithm 6 print?  
(d) What values will the code shown in Algorithm 7 print?

**3. (5 pts)**The Fibonacci numbers are computed according to the following relation

$$F_n = F_{n-1} + F_{n-2}$$

with  $F_0 = F_1 = 1$ . Write a MATLAB script that outputs a row vector that contains the first 10 terms of the Fibonacci sequence.

**IMPORTANT:** Name your MATLAB script `fibonacci_user.m`. Replace `user` with your drexel.edu e-mail username. For example, since my e-mail username is `mah349`, I would name my script `fibonacci_mah349.m`.

**Extra Credit: (2 pts)** Write a MATLAB script that outputs a row vector The second output vector that contains the first 6 even terms of the Fibonacci sequence. The `mod` function here may be useful. To understand how to use the `mod` function, type `help mod` at the command prompt. Name your MATLAB script `extraCredit_user.m` where `user` is your Drexel username.

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**Algorithm 6** Pseudocode for 2(c)

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```
a = 1
while a < 100 do
    a = a*2
end while
```

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**Algorithm 7** Pseudocode for 2(d)

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```
a = 1;
n = 1;
while a < 100 do
    a = a*n
    n = n + 1;
end while
```

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4. (5 pts) Write a MATLAB script that approximates  $\pi$  by computing the sum

$$\pi \approx 4 \sum_{k=0}^m \frac{(-1)^k}{2k+1}$$

The more terms you keep in the summation, the more accurate your answer will be. (In fact, the series converges to  $\pi$  as  $m$  goes to infinity. This is by no means the most efficient way to approximate  $\pi$ , but the formula is quite elegant.) Use the sum to approximate PI using 10, 100, 1000, 10000 and 100000 terms. For each of these number, compute the error of the approximation. Plot the error as a function of the number of terms used in the sum. To plot, type `help plot` on the MATLAB command line.

5. (10 pts) For this last problem you will code up the software for a vending machine in MATLAB. Assume the vending machine sells 10 different items all for the same price. The vending machine can be in any of four states:  $x_1$  - waiting for money,  $x_2$  - waiting for user to select item,  $x_3$  - vending item, and  $x_4$  - returning change. In each of these states, the machine has a set of actions that it needs to execute. For example, if the machine is in the  $x_1$  state, it needs to prompt the user for money. Once the user has put in enough money, the machine should ask the user to choose on of the available items. Once the user has selected the desired item, the machine should vend the item or let the user know that the selected item has run out. At this point, the machine can either return the money to the user or prompt the user to select a different item. Using what you have learned in lecture, select 10 different items for a vending machine. Now design the software that would run on the vending machine. Your main program should be named `vendingMachine_user.m` such that `user` is replaced with your Drexel e-mail username. You are highly encouraged to write separate functions so as to enable the vending machine to execute the various commands. The functions `input` and `disp` will be helpful here.

**Extra Credit: (5 pts)** Assume you have 10 different items such that some of are priced different from the others. Change your code to accomodate the different prices. You should name your main program `vendingMachineEC_user.m` where `user` is replaced with your Drexel e-mail username.