Due date: Wednesday, February 6, 2019, at 9:30 AM.

Objective: To write and run a python program that iteratively computes a finite series involving powers and factorials.

Problem: The program will compute the sum of three different finite series. A finite series is a summation of the form

$$\sum_{n=0}^{N} t_n = t_0 + t_1 + \cdots + t_N.$$

In this assignment, the terms of the sequence involve powers and factorials. Hence, the terms of the series are to be computed iteratively.

(1) As in homework assignment 3, use the `input` method to scan in a value for x of type `float`, and echo the value to the output.

(2) Taking the x value entered in (1), use an iterative loop to compute the sum $E = r_0 + r_1 + \cdots + r_N$, where $r_n = \frac{x^n}{n!}$. Equivalently,

$$E = \sum_{n=0}^{N} \frac{x^n}{n!} = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} \cdots + \frac{x^N}{N!}.$$

Print out the value of the last term of the series r_N, the sum E, and the value of $\exp x$.

(3) Using the same x value entered in (1), use an iterative loop to compute the sum $S = s_0 + s_1 + \cdots + s_N$, where $s_n = \frac{(-1)^n x^{2n+1}}{(2n+1)!}$. Equivalently,

$$S = \sum_{n=0}^{N} \frac{(-1)^n x^{2n+1}}{(2n+1)!} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots + \frac{(-1)^N x^{2N+1}}{(2N+1)!}.$$

Print out the value of the last term of the series s_N, the sum S, and the value of $\sin x$.

(4) Using the x from (1), use an iterative loop to compute the sum $C = t_0 + t_1 + \cdots + t_N$, where $t_n = \frac{(-1)^n x^{2n}}{(2n)!}$. Equivalently,

$$C = \sum_{n=0}^{N} \frac{(-1)^n x^{2n}}{(2n)!} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots + \frac{(-1)^N x^{2N}}{(2N)!}.$$

Print out the value of the last term of the series t_N, the sum C, and the value of $\cos x$.

The exponential and trigonometric functions are available through the math module. To access them, include the line

```
import math
```

near the top of the script. Your program should work for any $N > 0$. For testing purposes, declare N to be 10 inside your program. For example, you can use the line `N = 10` somewhere near the top. Your program can be structured as three consecutive `for` loops. If x is given the value 1.0, the output from your program should look something like this:

```
Enter x: 1
The value of x is  1.0
Using N = 10
r_N = 2.7557319223985894e-07 E = 2.7182818011463845 exp(x) = 2.718281828459045
s_N = 1.9572941063391263e-20 S = 0.8414709848078965 sin(x) = 0.8414709848078965
t_N = 4.1103176233121653e-19 C = 0.5403023058681397 cos(x) = 0.5403023058681398
```

Submit your program: A comment at the top of the program should identify yourself and the assignment that you are submitting:

```
"""
   Student name
   Homework number 4
"""
```

From your FAU student email account, send a message to Ford@fau.edu containing:

(1) The return address should be your fau.edu email address.
(2) The subject line should be: Subject: MAD2502, HW 4.
(3) Include the python program as an attachment (of type text/plain) using this name: "hw4.py".