Homework 1: Introduction to Python

For the following exercises, write your code in one or more text file(s) ending with extension `.py`*. Be sure to use a plain text editor (i.e., NOT Word). For parts that require written explanation, use the* `print()` *function to print your answers to the screen when the script is run.*

Note that unlike with using the `Python` *interpreter, commands will not print out to the screen automatically when run through a scripting file. Wrap each command you'd like to print to the screen in the function* `print()` *or save the command's output to a variable and then print the variable.*

Problem 1 (2 pts)

Use the `sum` command described in the lecture notes to find the result for the sum of $1 - 1/2 + 1/3 - 1/4 + 1/5 - 1/6 + \ldots$ for several numbers of terms (say 10, 100, 1000).

(Hint: read up on the range function online and see how to make it start at 1 instead of 0.)

Problem 2 (3 pts)

Find the online documentation on the `Python` `math` module to familiarize yourself with the functions used in the problem.

Evaluate each of the following using commands from the `math` module and explain their output:

(a) the square of the sine of $\pi/4$;

(b) the natural logarithm of e, the base for natural logarithms (try `math.e`);

(c) the natural logarithm of 10;

(d) the base 10 logarithm of 10;

(e) the absolute value of -5.4;

(f) the square root of 40 (can you find two ways to do this with what we've learned so far?).

Problem 3 (5 pts)

Verify that the following infinite series equals $\pi/4$:

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots$$

First, figure out how to represent the pattern using an index n. Then we can generate the list of terms as in the notes. Obviously, we can't really take `n` to infinity with this series so try letting it go for some large values of `n`.

Note that to complete the problem, you need to compare the answer for increasing numbers of terms in the sum to $\pi/4$ and show that the difference gets smaller.

Problem 4 (5 pts)

For this problem, try to figure out the answer before executing the command. You must **explain your reasoning** (using a `print` command) for full credit!

Use the precedence and arithmetic rules of `Python` to predict the values of each of the following expressions:

(a) 2*3 + 4/2;

(b) 5 - 6 + 7**2

(c) 1 - 2 ** (8/4)

(d) 8 / 4 / 2

(e) 8 / (4/2)

(f) (4/2)**3 - 7**8 + 7**8

(g) 14/10

(h) 8 + 2 ** 4 / 2

Submission

Submit your `Python` script file (or files) from the problems above on Canvas.

Be sure that they run without error, and remember to use the `print` function to get the results of your commands to print out to the screen.

If you get stuck, don't hesitate to ask questions in class, during office hours, or by email.