Laboratory 4 — Loops, Functions, Lists, and Strings

1. Write a function that calculates $\sum_{k=0}^{100} \frac{(-1)^k}{(2k+1)!} x^{2k+1}$ as a function of *x*. Then compare the value of this function with the sine-function for $x \in \{-10, -9, \ldots, 9, 10\}$. Remember that `math.factorial(x)` calculates x!.

2. Write a function that takes a string and returns the same string with:

    1. All vowels changed to the following vowel in the alphabet: a to e, e to i, i to o, o to u, u to a.

    2. All vowels changes to digits: a to 1, e to 2, i to 3, o to 4, and u to 5

    3. All vowels replaces with a hashtag

3. Write a function that takes as input a number *n* and returns True if the number is a prime number and False otherwise. You check by searching for a divisor. The number x divides the number y exactly if `y%x == 0`.

4. Write a function that checks whether a string is a palindrome. However now, the function ignores punctuation marks and white spaces.

5. Write a function that takes as input a list and only returns those elements in the list that appear at least twice. (This is actually quite tricky. Create a list with all elements that have been already seen once. Then create another list with all elements that have been seen at least twice. Return the latter.)