ENG-101 Intro Computing Engineers

Due: 20 September 2021 at the start of class

Question 1 (10 Points)

Write a well-documented Python Program *hmwk3Q1.py* that has a main function to accept an integer from a user. The program calls a function is_power_of_two(n) that accepts an integer and determines if the integer is a power of two.

Grading 2 points for the well-documented program submitted to *hmwk3Q1.py*. 4 points for a correct is_power_of_two function. 4 points for a correct main function.

Question 2 (10 Points)

Write a well-documented Python Program *hmwk3Q2.py* that has a main function to accept an integer N from a user. The main function determines the number of prime numbers between 2 and N. The program calls a function is_prime(n) that accepts an integer and determines if the integer is a prime.

Grading 2 points for the well-documented program submitted to *hmwk3Q2.py*. 4 points for a correct is_prime function. 4 points for a correct main function.

Question 3 (10 Points)

Write a well-documented Python Program *hmwk3Q3.py* that has a main function to accept an integer N from a user. The main function determines the number of strong numbers between 2 and N. The program calls a function is_strong(n) that accepts an integer and determines if the integer is a strong number. A strong number is a number whose sum of the factorial of digits is equal to the number. That is 145 is a strong number since, 1! + 4! + 5! = 145. You may import the math function factorial into your solution.

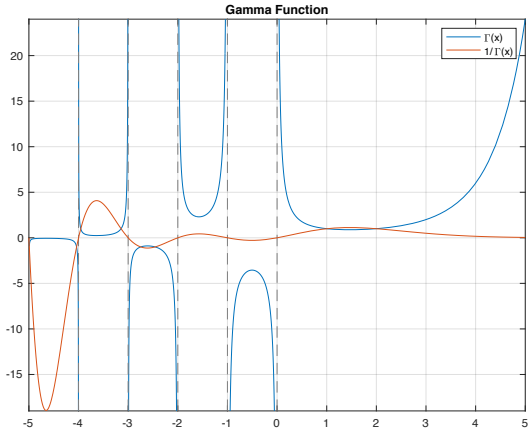
In a comment within *hmwk3Q3.py* record the number of strong numbers between 1 and 100451

Grading 2 points for the well-documented program submitted to *hmwk3Q3.py*. 4 points for a correct is_prime function. 4 points for a correct main function.

Question 4 (10 Points)

Write a well-documented Python Program *hmwk3Q4.py* that defines a function $myGamma(z, N)$. The function $myGamma$ computes an estimate of Γ from the finite series

$\Gamma(z, N) = \frac{1}{z}\prod_{n=1}^{N}\left((1 + \frac{1}{n})^{z}(1 + \frac{z}{n})^{-1}\right)$, which is value except for $z \in \{0, -1, -2, \ldots\}$.



Grading 2 points for the well-documented program submitted to *hmwk3Q4.py*. 8 points for a correct solution.

Question 5 (10 Points)

Write a well-documented Python Program *hmwk3Q5.py* that uses the $myGamma$ function in the earlier question and the gamma function within the Python math module $\Gamma(z)$. Design a main function that accepts an acceptable error ϵ (from the user) between the gamma functions, that is $|myGamma(z, N) - \Gamma(z)| < \epsilon$. Use a while loop to find N, such that $|myGamma(5, N) - \Gamma(5)| < 1$.

As a comment in the program, record the value of N for the case depicted above.

Grading 2 points for the well-documented program submitted to *hmwk2Q5.py*. 8 points for a correct solution.