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CS 323, Section 1 Assignment 1

1) The absolute error of the Stirling Approximation grows as n increases. The relative error shrinks as n increases. The result rounds down due to insufficient space to store the number. Therefore, when changing the precision, the result is less precise as a single precision number than a double precision number.
2) Find the at least one root for the following equations:
   $F(x) = e^x - \sin(x) - 2$; $e = 10^{-10}$
   $F(x) = x^2 - 4x + 4 - \ln(x)$; $e = 10^{-10}$
   A) Root found with Bisection: 1.05412712408 (interval [0, 2])
      Root found with Newton: 1.05412712409 ($X_0 = 1.5$)
      Root found with Secant: 1.05412712409 ($X_0 = 0$, $X_1 = 2$)
   B) Root found with Bisection: 1.41239117208 (interval [0, 2])
      Root found with Newton: 1.41239117202 ($X_0 = 1.5$)
      Root found with Secant: 1.41239117202 ($X_0 = 1$, $X_1 = 2$)

--More explanation for Assign1P2.py:

To run the program, the correct set of arguments needs to be inputted. The program prints out a message telling the user how to correctly input the arguments. There are different sets of arguments required for each method. These are the sets of arguments:

python Assign1P2 bisection <a> <b> <error_tolerance> <max_iterations> <function_number>

python Assign1P2 newton <x0> <error_tolerance> <max_iterations> <function_number>

python Assign1P2 secant <point1> <point2> <error_tolerance> <max_iterations> <function_number>

<a> and <b> is the interval required for the bisection method. <x0> is the starting point for the newton method. <point1> and <point2> are single values required for the secant method. <error_tolerance> should be given as a float value (e.g. $10^{-10} = 0.0000000001$). <max_iterations> is the maximum amount of iterations as an integer. The <function_number> is the argument used to determine which function to find the root of. There are two functions hardcoded in that can be chosen:

1 => $e^x - \sin(x) - 2$

2 => $x^2 - 4x + 4 - \ln(x)$