NumAnal - Fall 2022
Project #1

Due 09/02/22

Problem 1: python :(

Numerical Computing :: Project One

Execute the following lines in a Python interpreter.

```
>>> x = 9.4
>>> y = x - 9
>>> z = y - 0.4
>>> print(z)
```

What did you get for z? What should it be in exact arithmetic? Why is it not what it should be?

See Sauer's *Numerical Analysis* Chapter 0.3.3 for a complete description of the rounding phenomenon.

Answer

- $z = 3.3306690738754696e - 16$

- In exact arithmetic, it should be $z = 0$

- This is due to the nature of ϵ_{mach}, which is defined as the smallest floating point number that is greater than 1. As this numbering system is unable to reach exactly 1, each calculation can introduce more and more error from this systems' ever so slight value difference from true real numbers. With the way 9.4 and 9 are represented in floating point, their exponent bit is largely negative and their mantissa is incredibly small / rounded, the arithmetic has just enough error to give some very small number rather than the true 0.