Assignment 1

Implementing and Analyzing Custom Square Root Function

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1 Introduction to `sqrt()` in `math.h`

The `sqrt()` function in the `math.h` library is a standard C function that computes the square root of a given number. It is highly optimized to provide results with high precision (up to 15-16 decimal places when using `double`). The function is implemented at a low level, often leveraging specialized hardware instructions for efficient and fast computation. For most practical applications, `sqrt()` is a reliable and efficient way to compute square roots.

2 Problem Statement

Write a function `sqrtUser()` to calculate the square root of a number from scratch, without using the `math.h` library. The function should be defined with the following format:

```
double sqrtUser(double number, int n);
```

Where `number` is the input value whose square root is to be computed, and `n` is the number of decimal places for the result. Your task is to implement this function, ensuring that the result is accurate up to `n` decimal places.

You can use numerical methods such as:

- Binary Search Method: This method repeatedly narrows the search interval until the square root is found with the desired precision.
- Newton-Raphson Method: This method uses iterative refinement to approximate the square root faster.

Develop your own logic to achieve the required precision and accuracy.

3 Time Complexity and Comparison

Find what is the of the algorithm used in `sqrtUser()`? What is the time complexity of the method you used to develop `sqrtUser()`? Which method is faster, your implementation or the `sqrt()` function from `math.h`? Explain why?

4 Submission On Avenue to Learn

Submit on Avenue the source code `sqrtUser.c` and your report named `README.pdf`. In your report, explain what method you have used, how to compile and run your program, and include the answers to above questions. **Create a section called Appendix in your report and include all your codes in this section in a text based format (not screenshots)**. Please do **NOT** submit any zip files.