CSE330 Section 20, Assignment 1

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1 Instructions

1. The deadline is **19 February 2026, during class**. There will be **no deadline extension**. Hence, don't wait for the last minute to submit.
2. Please start the assignment as soon as possible. If you start it just a day before the deadline, you might not be able to complete it.
3. If you take help from your friend (even if your friend is from a different section), or if you use ChatGPT to help you understand the material, you have to mention it on top of the first page of your assignment. Failing to do so will be considered as plagiarism and will have consequences as per the plagiarism policy.
4. Copying AI-generated answers without understanding or attribution will be treated as academic misconduct.
5. The total mark of this assignment is 15. However, there is 1 bonus question that is worth 2 points. Attempt the bonus questions only after you have solved all the other problems. If you get more than 15, then the extra points will be adjusted with other assignments.
6. Please feel free to reach out to me if you have any questions.

2 Problems

Problem 1 $(1+2+3+4 = 10$ points**).** Suppose you're working with a 11-bits IEEE normalized system, with 1 sign-bit, 6 bits for mantissa, 4 bits for exponent. We are choosing $\mathsf{bias} = -10$.

(a) What is the range of exponent?

(b) What is the largest representable number, and the smallest positive representable number in this system? Be mindful of storing $\pm\infty$ and ± 0.

(c) Express 0.1, 0.2, 0.3 in this system.

(d) Add 0.1 and 0.2 (in this floating point system), and check whether it equals 0.3.

Problem 2 $(2 + 2 + 1 = 5$ points**).** Consider the quadratic equation:

$$x^2 - 12x + 5 = 0.$$

(a) Compute the roots of the quadratic equation while keeping to four significant figures.

(b) Explain how loss of significance occurs in this case due to the subtraction of nearly equal numbers.

(c) Discuss an alternative approach to computing the roots to avoid loss of significance, and use this method to determine the correct roots.

Problem 3 (Bonus and self-study, 2 points)**.** Your programming language thinks $0.1 + 0.2 \neq 0.3$ due to rounding error. But your calculator shows $0.1 + 0.2 = 0.3$. Why?