University of Waterloo
CS240 Winter 2025
Assignment 1 Post-Mortem

General

- Students are encouraged to use LaTeXwhen writing assignments. There were handwritten solutions that were difficult for markers to read.

Question 1 [1+1+1+1=4 marks]

- This question was well done.

Question 2 [3+3+3+3=12 marks]

- This question was generally well done.
- Some students provided solutions using the limit theorem. When asked to prove from first principles, you must solve using the definition of order notation.

Question 3 [3+3=6 marks]

- Many students attempted to prove these statements instead of disproving.

Question 4 [3 marks]

- This question was well done.

Question 5 [5 marks]

- Some students struggled to prove $f(n) \notin o(n^4)$. Showing the existence of some $c > 0$ such that the desired inequality does not hold for all $n \geq n_0$ is enough to prove this.
- Some students struggled to understand the definitions of $f(n) \notin \Theta(n^4)$ and $f(n) \notin o(n^4)$.

Question 6 [4+4 = 8 marks]

- For part a, some students did not realize that the while loop only runs during the first iteration of the inner for loop.
- Part b was well done.

Question 7 [4 marks]

- Some students only showed an upper bound without sufficient argument as to why this bound was tight. A lower bound would need to be found as well.
- Some students did not realize the number of inner loop iterations was equal to the prefix sum at that index of the array. For example, at $i = 3$, inner loop iterations is $A[0] + A[1] + A[2] + A[3]$.

Question 8 [3 marks]

- Some students provided an unintended solution with summations $\sum_{i=1}^{\frac{n}{3}} \sum_{j=1}^{\frac{n}{3}} c$. This resulted in j exceeding i at some points in the given summation which was not the case in the original summation. Marks were deducted if the inequality was not clearly shown to be true in this case.