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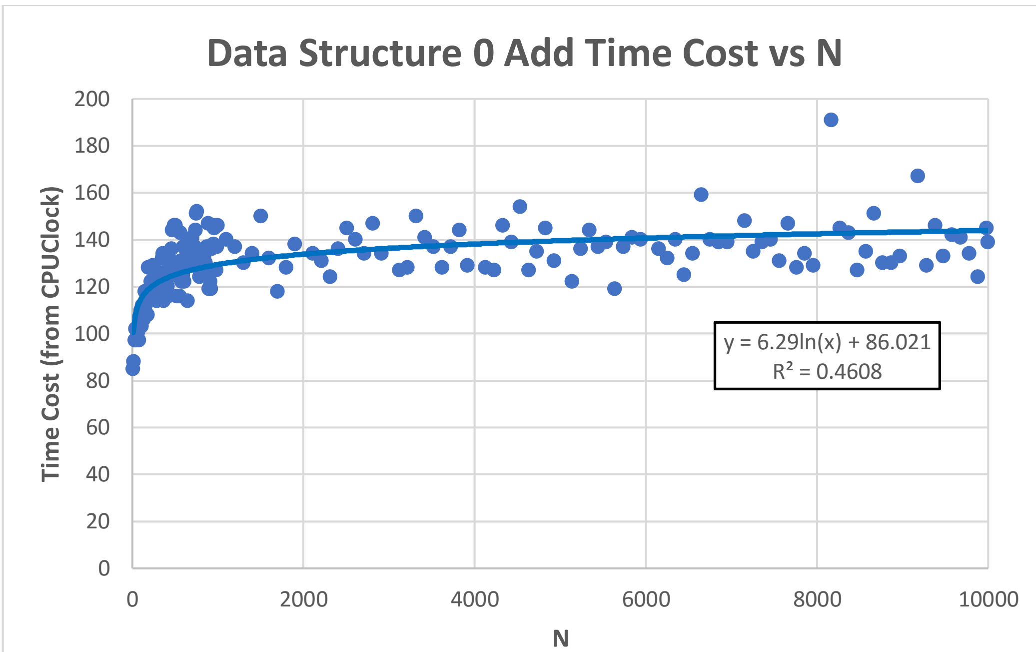
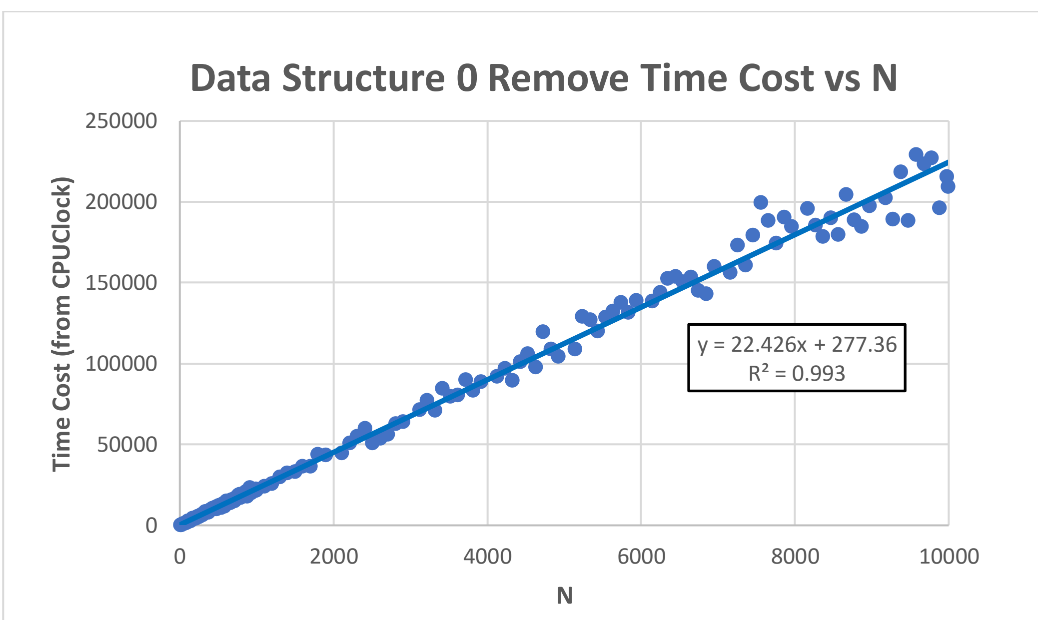
CS 210X - Accelerated Object Oriented Design Concepts
Project 4 Analysis
Mystery Data Structure Login: vsinha2

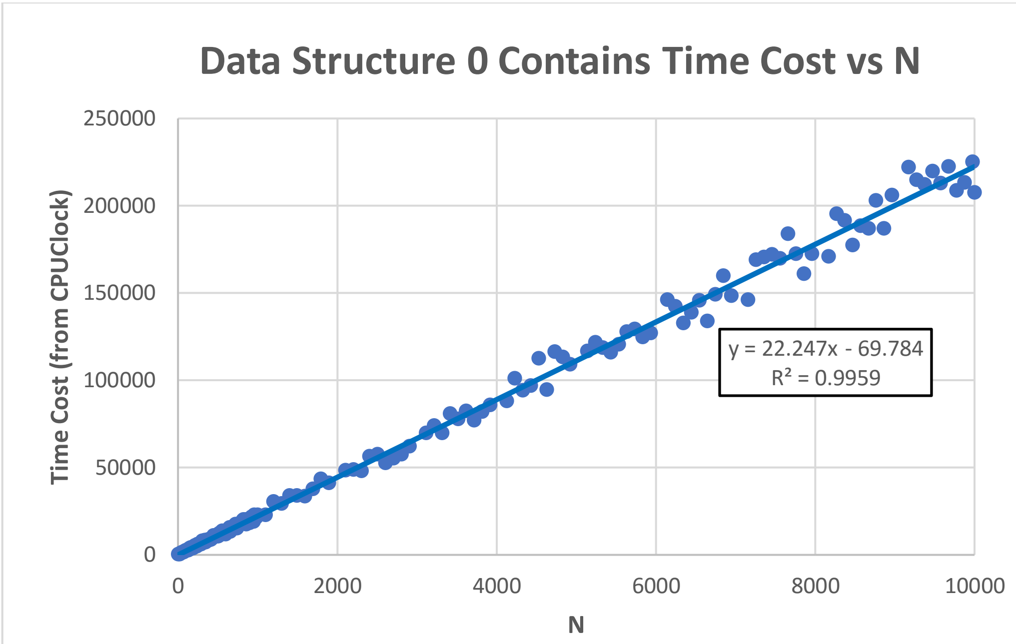
Mystery Data Structure 0



Graph 1: The graph of the time cost versus n of using add() with mystery data structure 0.



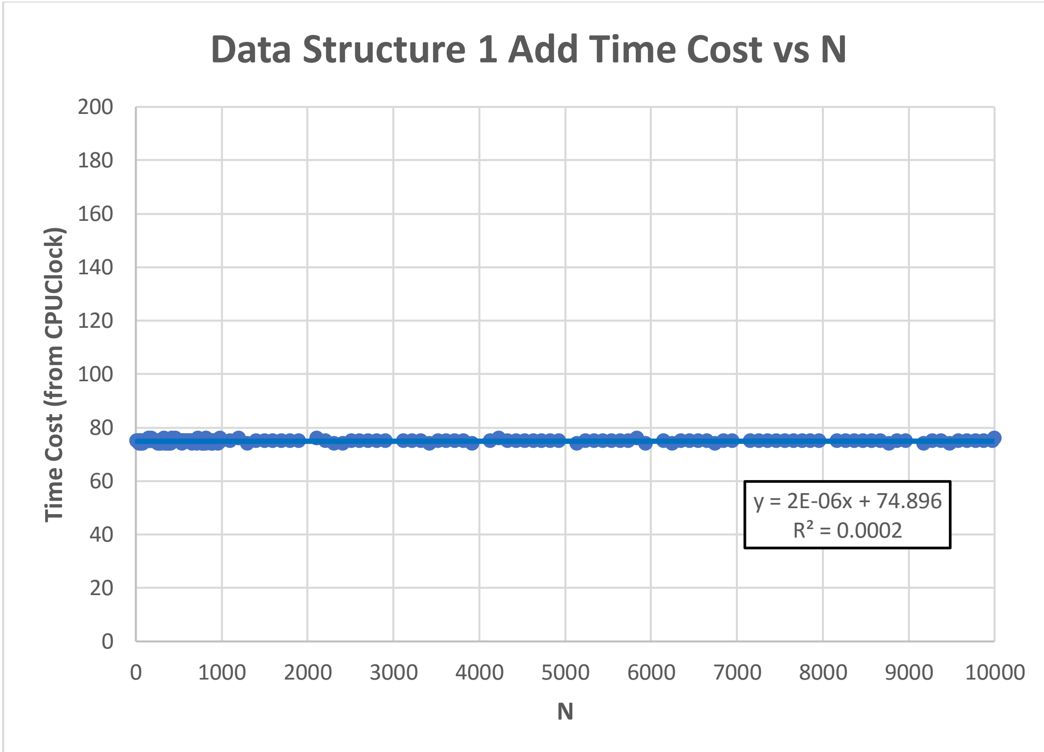
Graph 2: The graph of the time cost versus n of using remove() with mystery data structure 0.



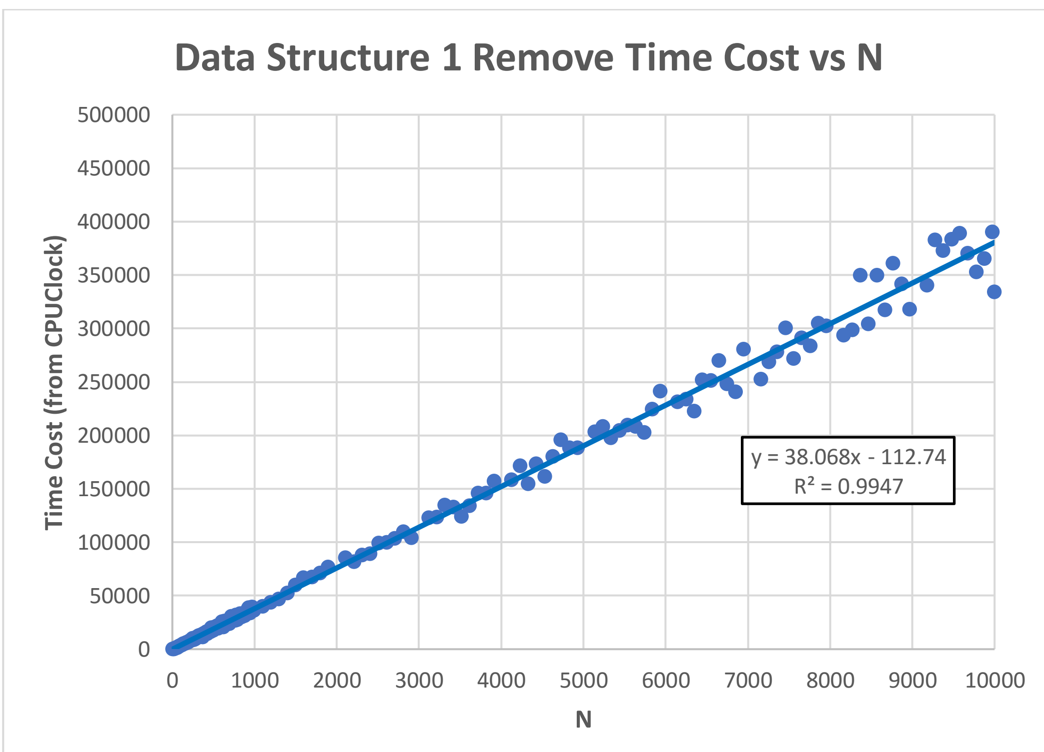
Graph 3: The graph of the time cost versus n of using contains() with mystery data structure 0.

We have deemed data structure 0 to be a heap. **Graph 1** shows a (rough) logarithmic shape, as the rate of change slows as N increases, which matches the O(log n) time cost of the add method for a heap. Furthermore, **Graph 2** and **Graph 3** clearly show a linear shape, which again conforms to the time costs of a heap.

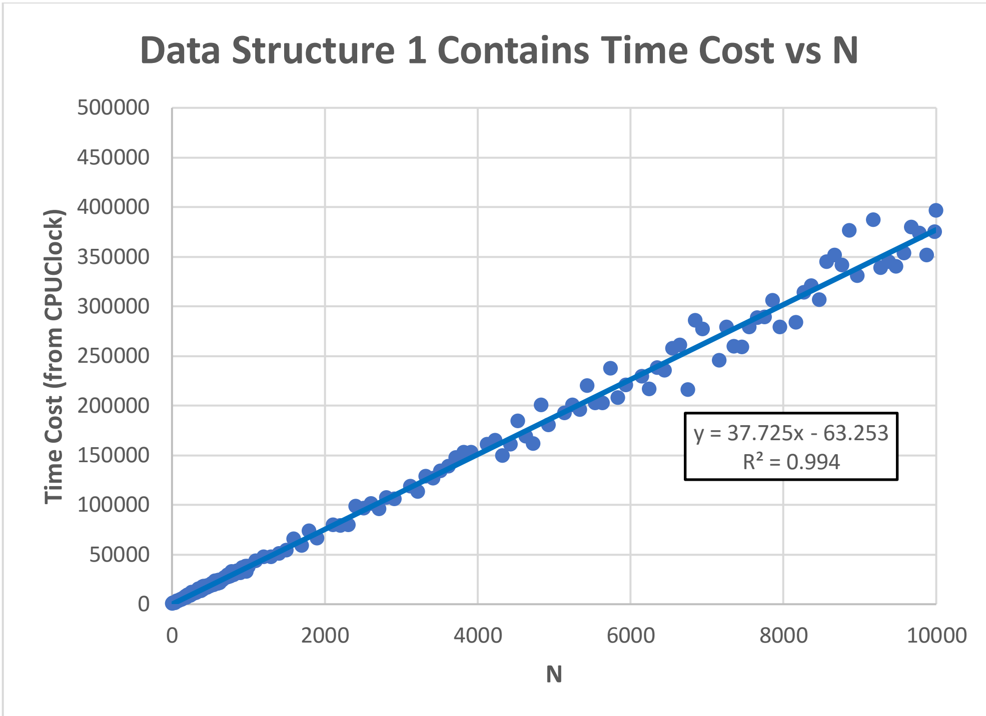
Mystery Data Structure 1



Graph 4: The graph of the time cost versus n of using add() with mystery data structure 1.



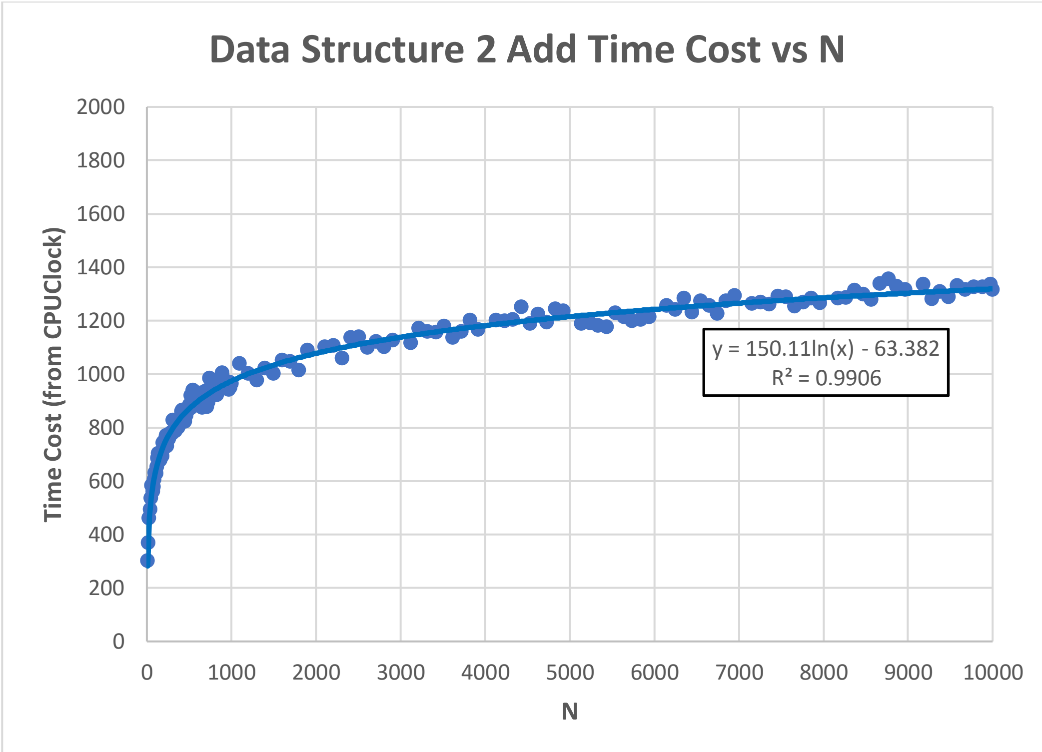
Graph 5: The graph of the time cost versus n of using remove() with mystery data structure 1.



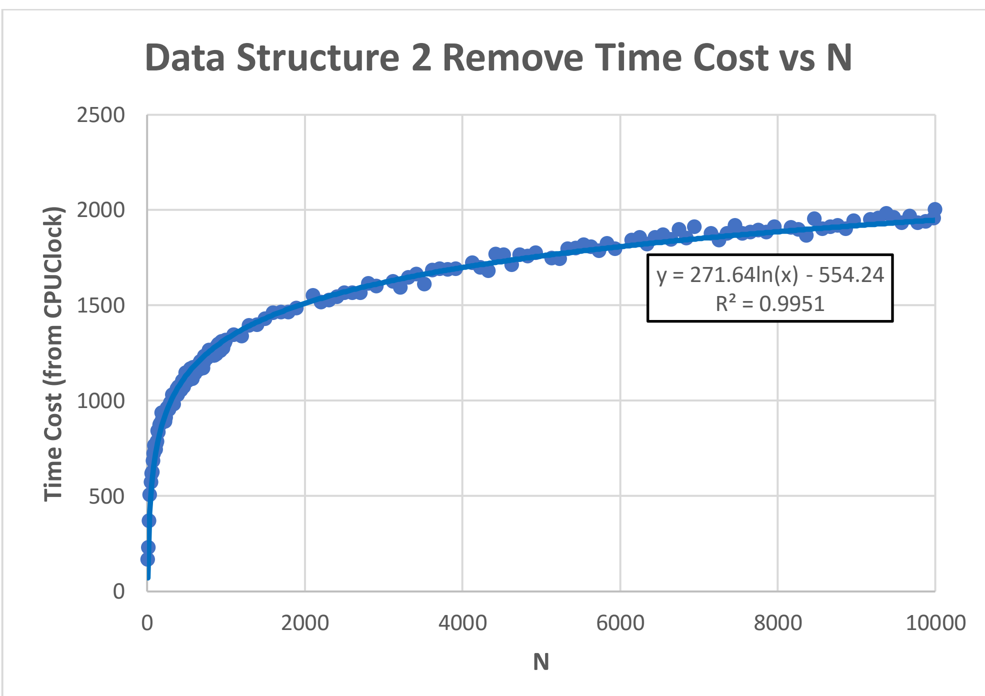
Graph 6: The graph of the time cost versus n of using contains() with mystery data structure 1.

We have deemed data structure 1 to be a doubly-linked list. **Graph 3** clearly depicts a O(1) time cost, which matches the time cost of the add method for a doubly linked list. Furthermore, **Graph 4** and **Graph 5** clearly show a linear shape, which again conforms to the time costs of a doubly linked list.

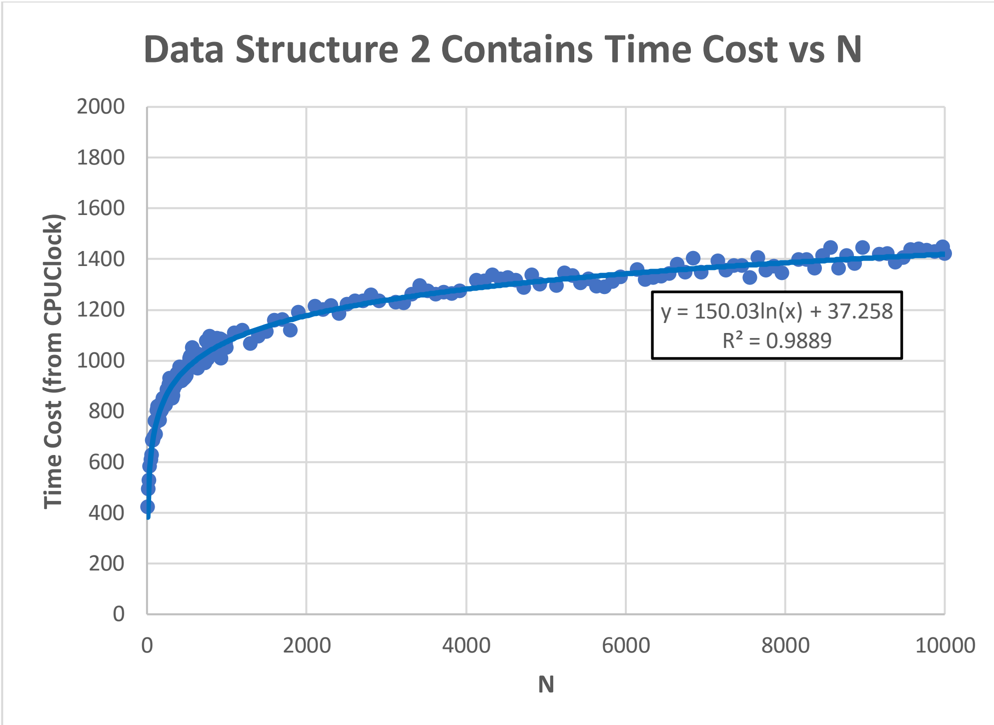
Mystery Data Structure 2



Graph 7: The graph of the time cost versus n of using add() with mystery data structure 2.



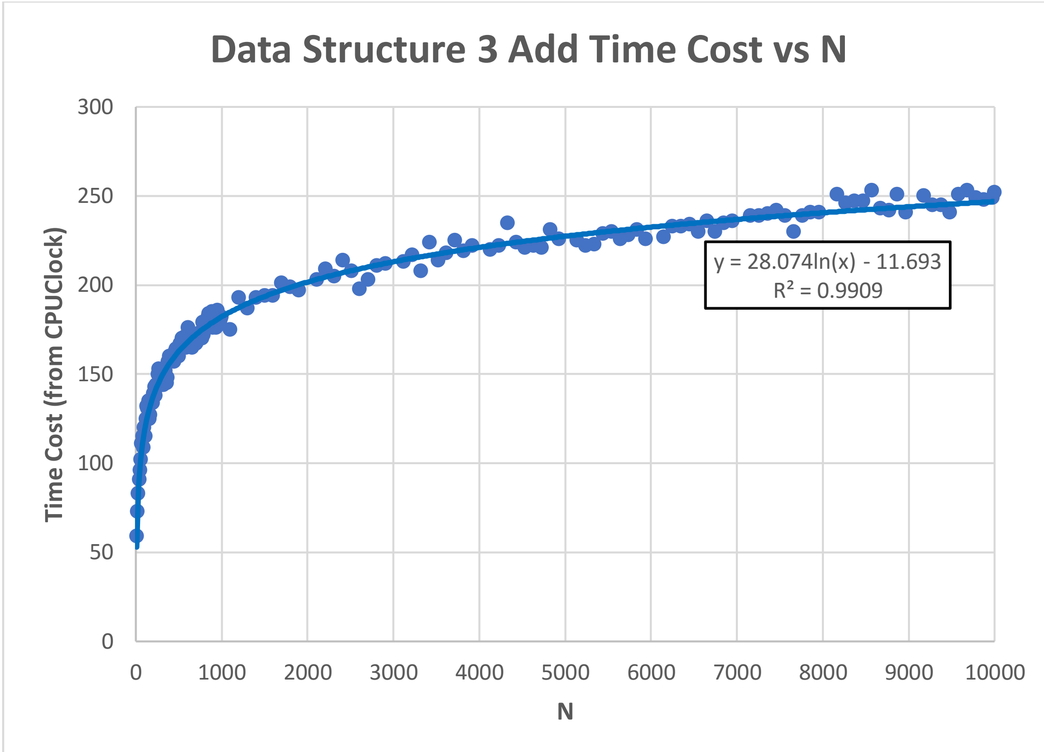
Graph 8: The graph of the time cost versus n of using remove() with mystery data structure 2.



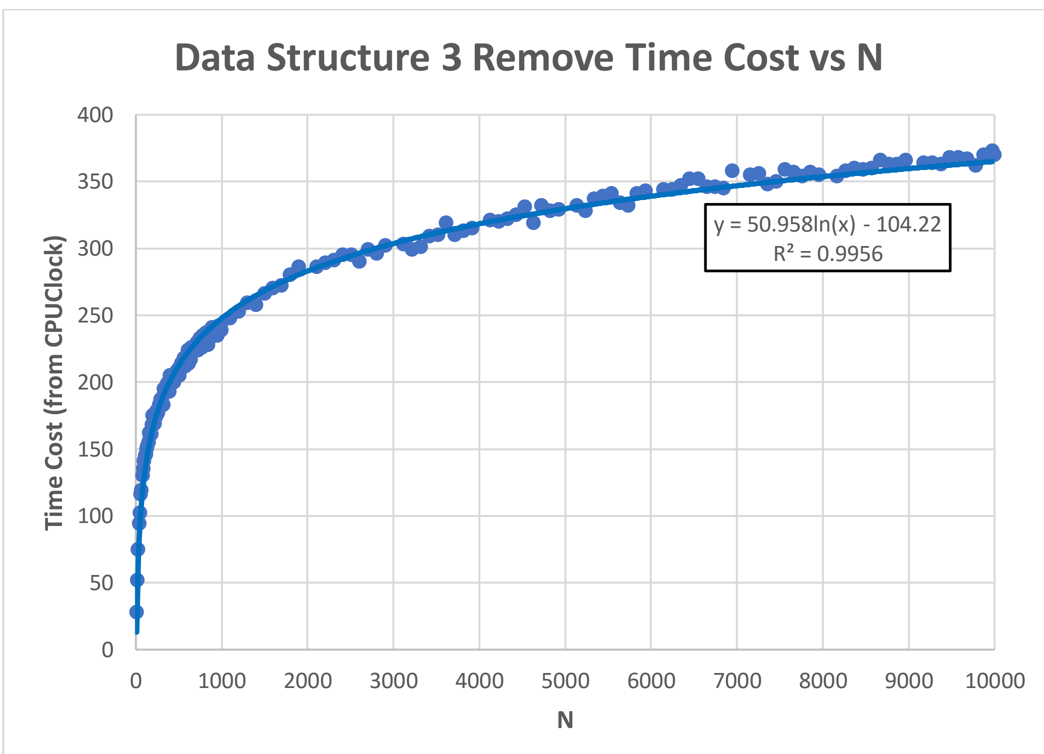
Graph 9: The graph of the time cost versus n of using contains() with mystery data structure 2.

We have deemed data structure 2 to be a binary search tree. **Graph 7**, **Graph 8**, and **Graph 9** show a logarithmic relationship between N and the asymptotic time cost, which matches the known time cost of a binary search tree for all 3 main methods: O(log n). In all three graphs, this self-balancing binary search tree shows a very accurate logarithmic curve with little variation.

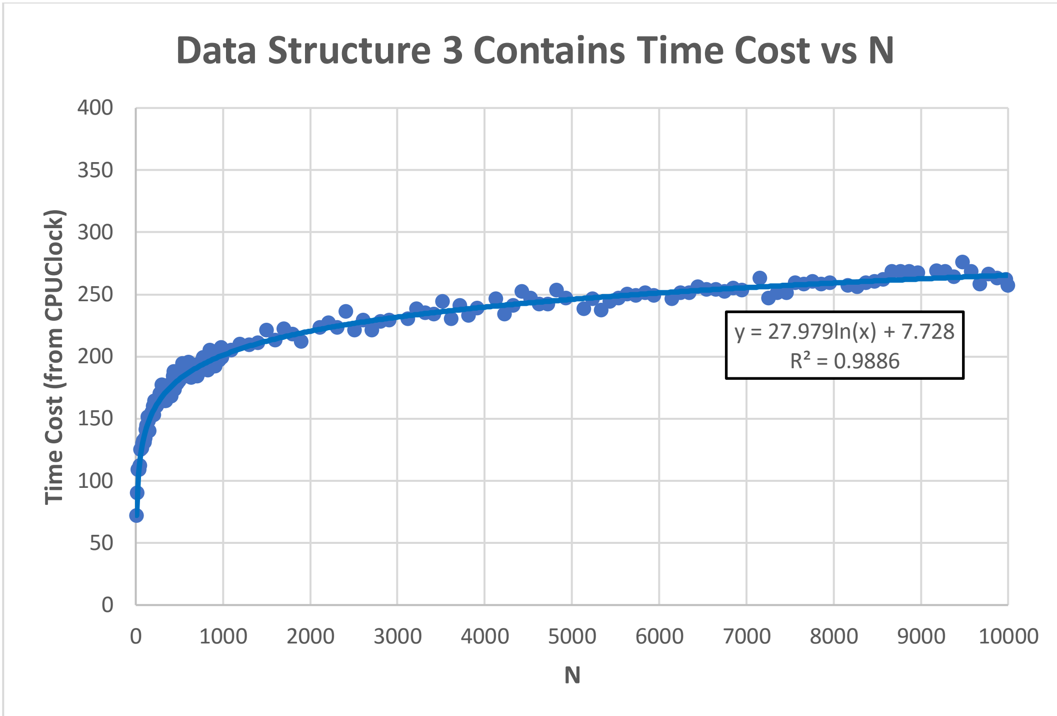
Mystery Data Structure 3



Graph 10: The graph of the time cost versus n of using add() with mystery data structure 3.



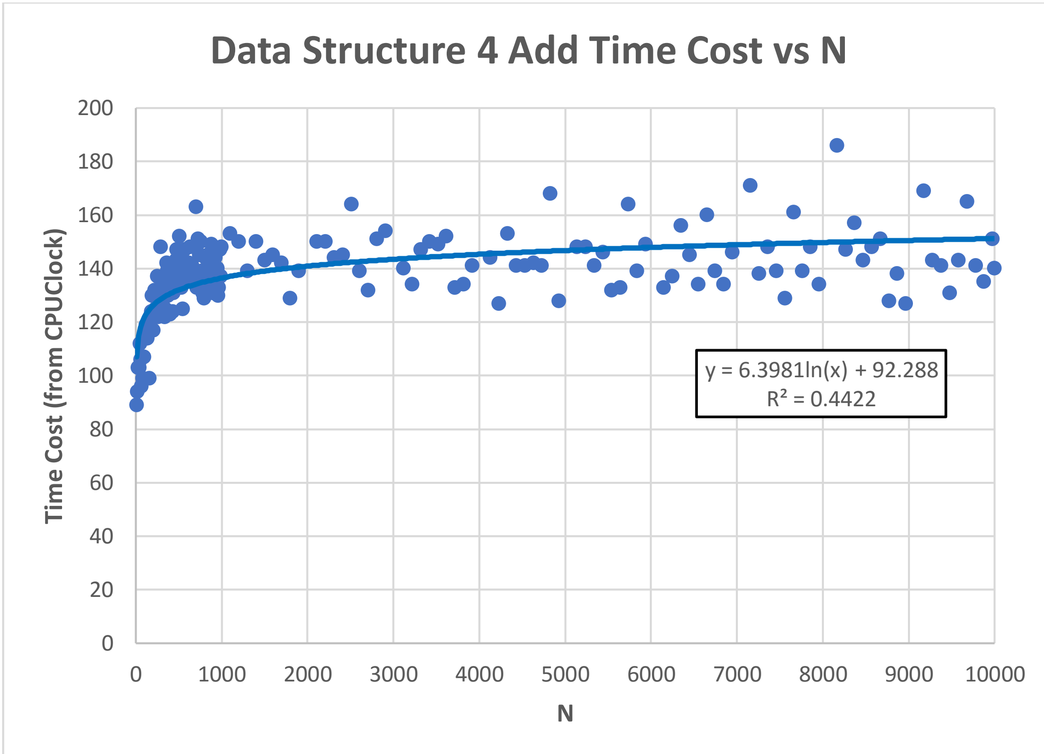
Graph 11: The graph of the time cost versus n of using remove() with mystery data structure 3.



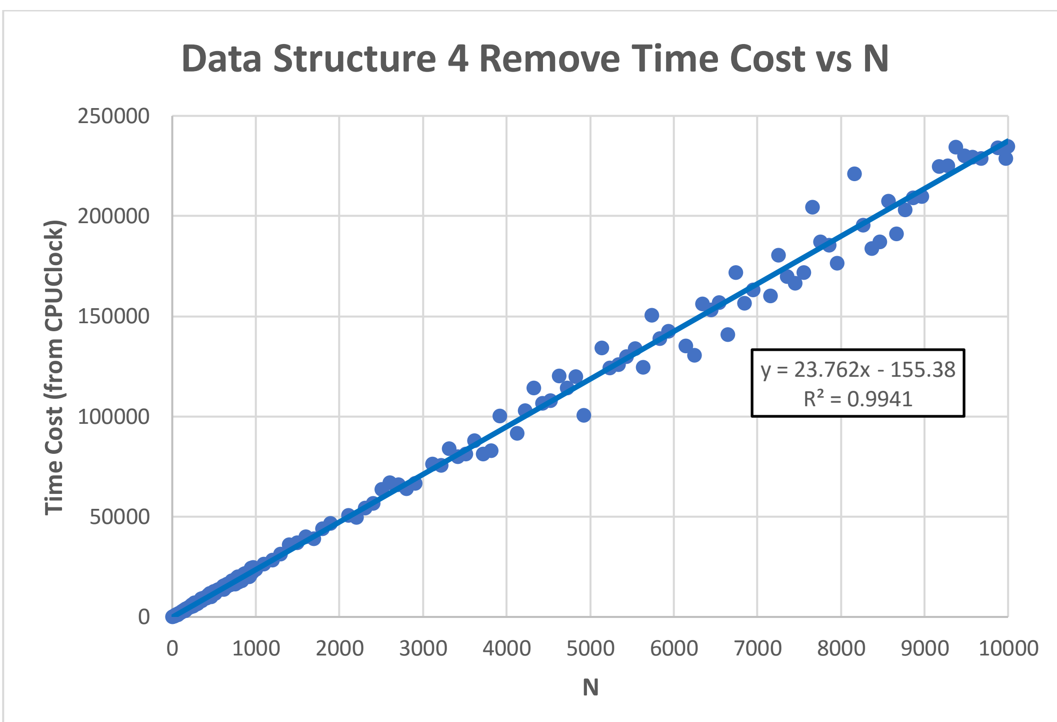
Graph 12: The graph of the time cost versus n of using contains() with mystery data structure 3.

We have deemed data structure 3 to be a binary search tree. **Graph 10**, **Graph 11**, and **Graph 12** show a logarithmic relationship between N and the asymptotic time cost, which matches the known time cost of a binary search tree for all 3 main methods: O(log n). In all three graphs, this self-balancing binary search tree shows a very accurate logarithmic curve with little variation as all three R^2 are greater than 0.98.

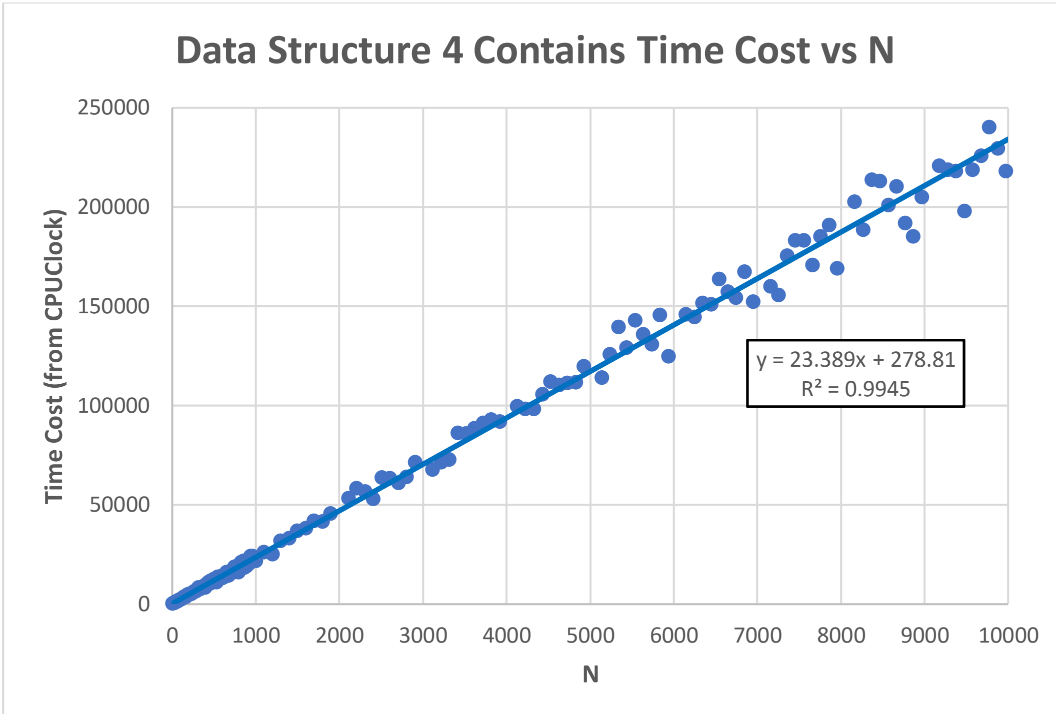
Mystery Data Structure 4



Graph 13: The graph of the time cost versus n of using add() with mystery data structure 4.



Graph 14: The graph of the time cost versus n of using remove() with mystery data structure 4.



Graph 15: The graph of the time cost versus n of using contains() with mystery data structure 4.

We have deemed data structure 4 to be a heap, the same as data structure 0. **Graph 13** shows a (rough) – again very similar to data structure 0 – logarithmic shape, as the rate of change slows as N increases, which matches the O(log n) time cost of the add method for a heap. Furthermore, **Graph 14** and **Graph 15** clearly show a linear shape, which again conforms to the time costs of a heap. Because the R^2 value of **Graph 13** is quite low (high variance) for both data structure 0 and this data structure, we have determined data structure 4 to be another occurrence of a heap.