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Programming Assignment 3
Problem 2: Comparison

Linked List

n	Memory usage KB	time ms
1000	0	0
2000	0	10
4000	0	30
8000	0	120
16000	0	510
32000	496	2050
64000	1496	8340
128000	3496	33440
256000	7492	215440

Dynamic Array

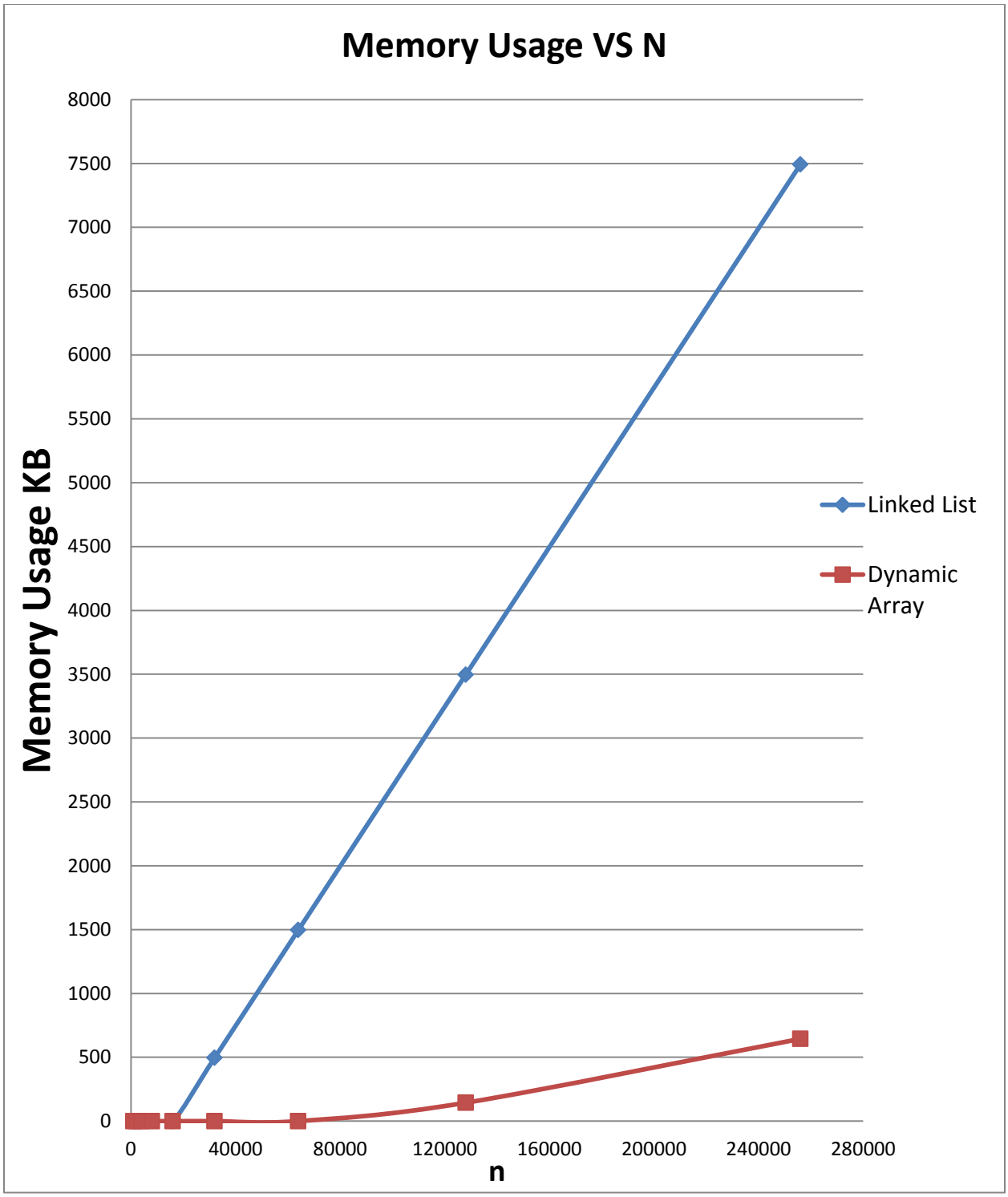
n	Memory usage KB	time ms
1000	0	0
2000	0	0
4000	0	20
8000	0	100
16000	0	390
32000	0	1580
64000	0	6250
128000	144	24880
256000	644	99830

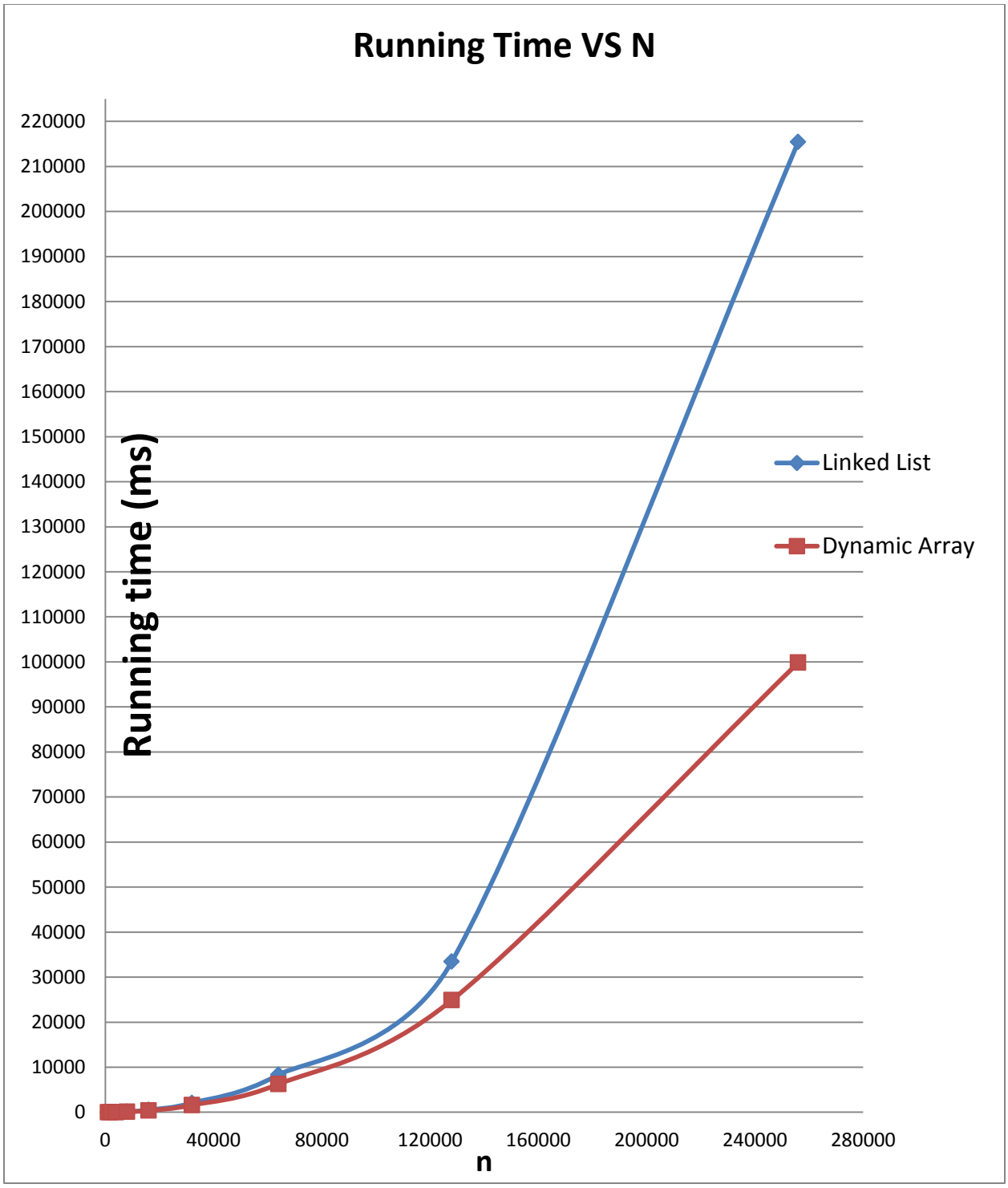
Which of the implementations uses more memory? Explain why.
Linked list uses more memory. I think this is due to the fact that linked lists have pointers to the first link, to the last link and to each next link. So it seems that a lot of memory is wasted on those pointers. Dynamic Array needs to store only the value.
Which of the implementations is the fastest? Explain why.
Dynamic Array is faster. My guess is that it is faster than liked list because nodes in the linked list are stored incontiguously and this increases the time required to access individual elements within the list. On the other hand, the elements in the dynamic array are stored in contiguous segment of memory, which make is easier, thus faster to transverse.

Would you expect anything to change if the loop performed **remove()** instead of **contains()**? If so, what?

I would expect that the dynamic array would have been slower if the remove () function was used instead. The reasoning is that in case an element needs to be removed in the middle of the array, we would need to slide up the elements to fill in the index of the removed element. At the same time, an array from which many elements are removed may also have to be resized in order to avoid wasting too much space. Any time there is an a change in the capacity of an array, we would need to copy and paste all elements from the old array to the new one.

As for the memory usage, I do not expect that many if any changes at all, if we perform remove() instead of contains().


Memory Usage VS N
Memory Usage KB
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
40000
80000
120000
160000
200000
240000
280000
n
Linked List
Dynamic Array


Running Time VS N
220000
210000
200000
190000
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Running time (ms)
0
40000
80000
120000
160000
200000
240000
280000
n
Linked List
Dynamic Array