Ex3 – Questions

1.) Derive the formulas for (i) number of comparisons, and (ii) average-case number of swaps for bubble sort

i)For bubble sort, the number of comparisons is determined by how many times items are compared.

During the first pass,
Number of comparisons = (N-1)
During the second pass,
Number of Comparisons = (N-2)
During the third pass,
Number of Comparisons = (N-3)
So at pass N-1, which is the final comparison of the sort, the number of comparisons is = 1.
So, by calculating the total number of comparisons, we do (N-1) + (N-2) + (N-3) + 1 = (n(n-1))/2, which is a quadratic complexity O(n^2).

ii)The average case number of swaps refers to it being of random order. In this case, the total number of swaps becomes (n(n-1))/4. This is because it is initially sorted in random order, which means that there is a 50% chance the number will be swapped and a 50% chance that it will not. Thus, the average number of swaps is half of the total number of comparisons. This is quadratic time complexity as well (O(n^2)).

4.) Graphs
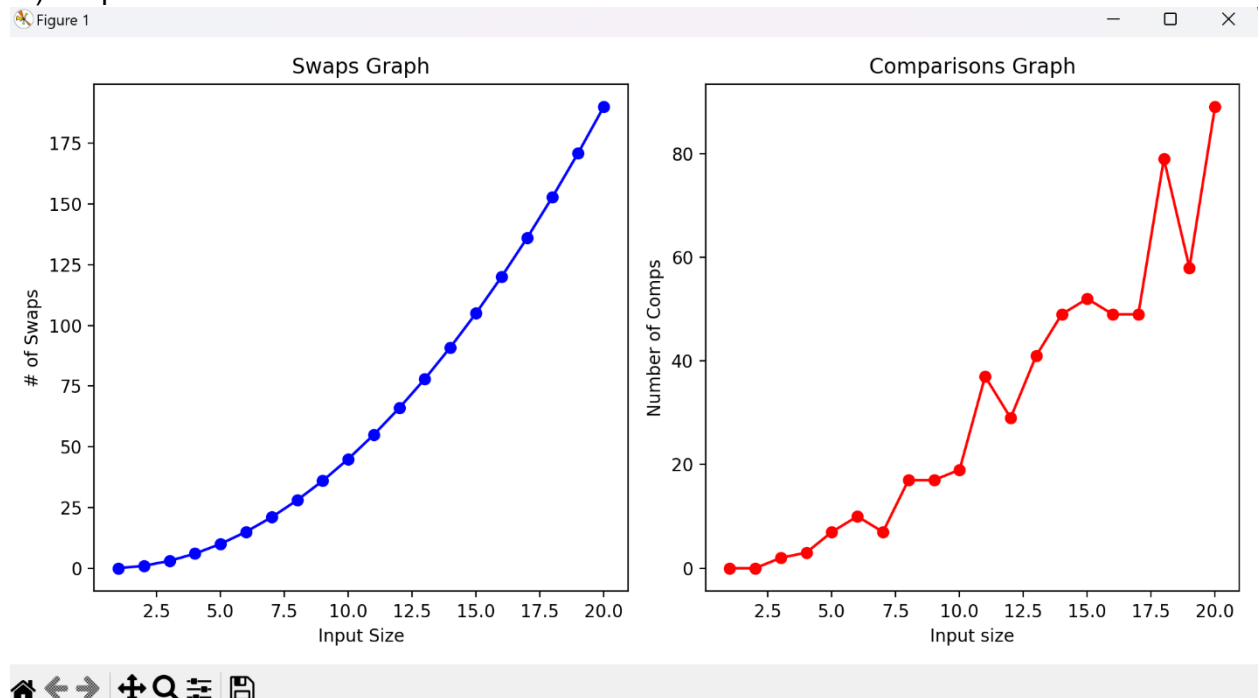
These graphs reflect what was expected to be the complexities for swaps, as both of them reflect O(n^2), which is quadratic.