

ex3

3.1.

(i) The number of comparisons in bubble sort is the sum of comparisons for each pass. The first pass has $n-1$ comparisons, the second pass has $n-2$ comparisons, the third pass has $n-3$ comparisons, and so on until the $(n-1)$ th pass.

$$\sum_{i=1}^n n - i = \frac{n(n-1)}{2}$$

So bubble sort has a time complexity of $O(n^2)$.

(ii) The number of swaps for bubble sort for its worst case is the same as its number of comparisons. The number of swaps for its average case is then half of the swaps for the worst case.

Number of swaps for n elements for average case: $\frac{n(n-1)}{4}$

3.4.

These graphs match the time complexity of $O(n^2)$, where the operations increase exponentially as the number of elements increases.

