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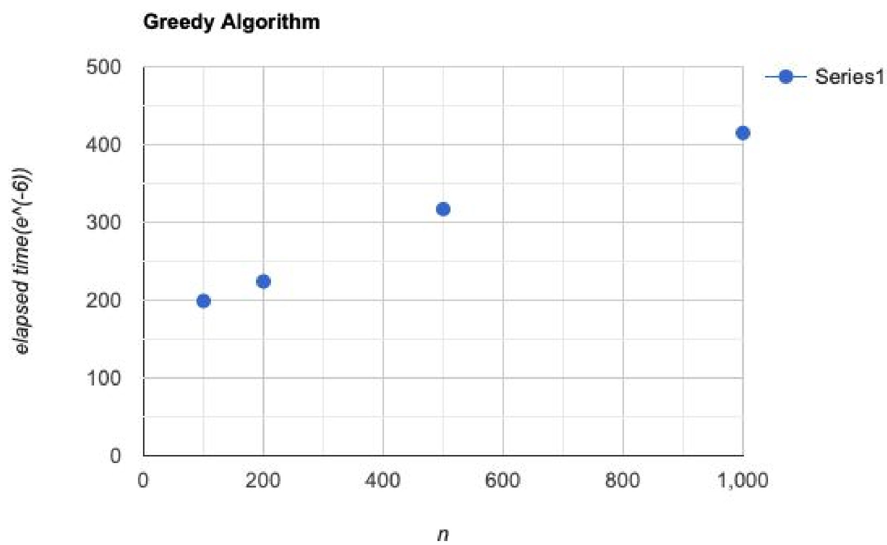
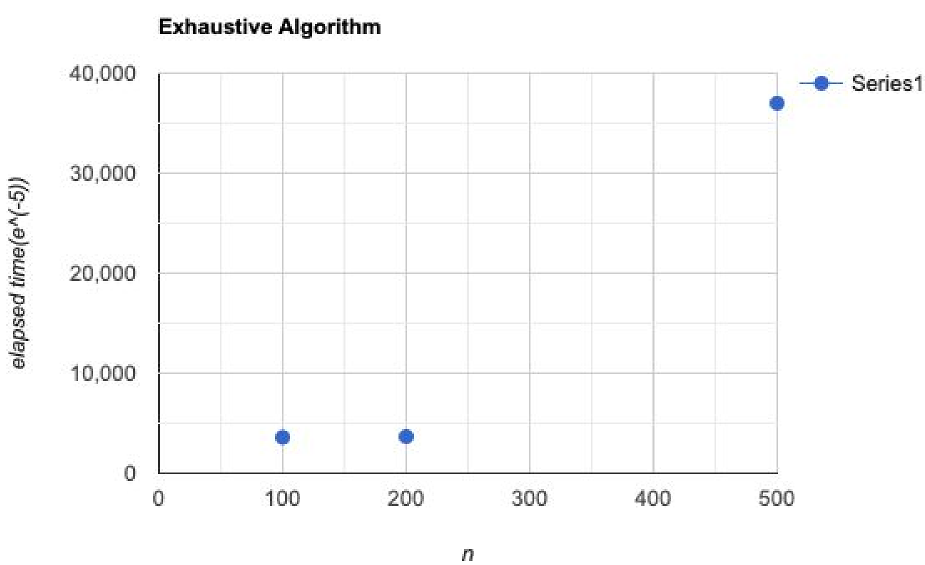
Scatter Plots

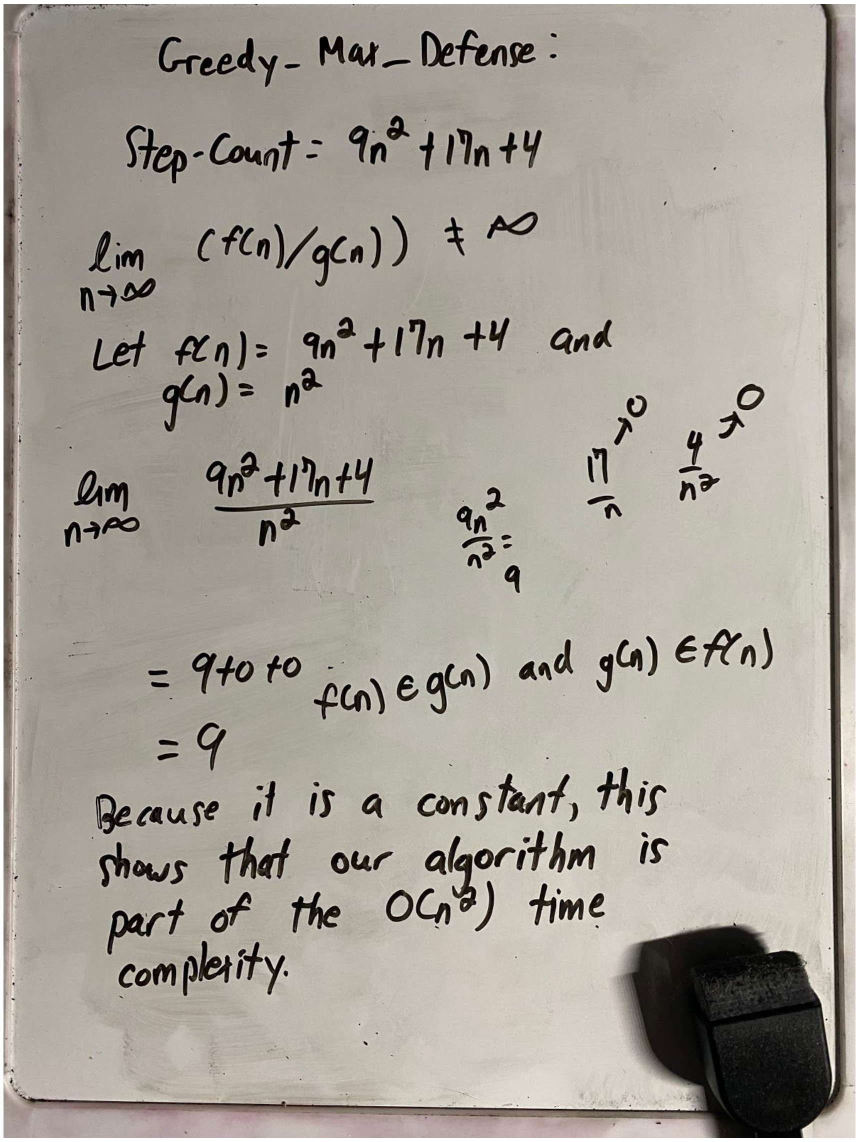




The vertical axis is 3595 is actually 3.595e^-5, it is just represented this way for simplicity. In order to read these graphs, follow the rule of turning 1000 to 1.000 e^(-5 or -6). This is different from each graph.

Mathematical Analysis

Greedy Algorithm:



Exhaustive Algorithm:

Two functions, f(n) and g(n), such that 0 <= f(n) <= C (g(n)).

0 <= $5n(2^n) + 5(2^n) + 5n + 21$ <= $C(2^n)$, C >= 21.

Questions:

a) There was a noticeable difference between the performance of the greedy algorithm and the exhaustive search algorithm. Greedy algorithm by faster algorithm by far because there was less computing required than the exhaustive algorithm. This does not surprise us because our step count analysis and time complexity analysis all concluded that the greedy algorithm will be fast.

b) Yes, the empirical analyses are consistent with our mathematical analysis. Using the scatter plots, we can see that the exhaustive algorithm increases at an exponential rate. This matches our time complexity of O(2n * n). Whereas the greedy algorithm increases at a more consistent rate. The scatter plot demonstrates that the greedy algorithm doesn't increase at neither a linear rate or cubic rate.

c) Yes, the evidence is consistent with our hypothesis because as n gets larger, the elapsed time gets significantly longer. It also shows that the rate in which elapsed time of the greedy algorithm is increasing is significantly less than the rate of the exhaustive algorithm.

d) Yes, the evidence is consistent with our hypothesis. As n gets larger, the elapsed time gets significantly longer. We can see that the exhaustive algorithm takes an exponential amount of time.