EXERCISE FOR CSE202 – WEEK 4

In this exercise, n is a power of 2. The complexity of Karatsuba's algorithm obeys

$$C(n) \leq 3C(n/2) + 4n.$$

From there, the Master Theorem allows one to conclude that $C(n) = O(n^{\log_2 3})$.

Question 1. *Following the steps of the proof of complexity, obtain an explicit bound on the constant of this $O()$ estimate.*

Question 2. *Assuming that for a given s, power of 2, the recursion stops when $n \leq s$ and the naive multiplication algorithm in $\leq 2n^2$ operations is used, show that the complexity is bounded by $f(s)n^{\log_2(3)}$ for an explicit function $f(s)$ that you have to determine.*

Question 3. *Optimizing the choice of s, how low can you get the constant?*