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CS 5050

Polynomial Multiplication Study

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When you look at the graphs, one page two, you can see that the “Divide & Conquer” Algorithm grows more slowly than the “High School” algorithm, but starts off slower with smaller polynomials. The reason for the difference in growth rates is the amount of work that is done in each algorithm. The “High School” algorithm computes four different multiplications, while the “Divide & Conquer” algorithm only computes three different multiplications, with a couple extra additions as the tradeoff. One can also see from the graphs that the slopes of the graphs are 2.0077 for the “High School” algorithm and 1.5376 for the “Divide & Conquer” algorithm. These calculated slopes are very similar to what was found in a previous theoretical analysis of the two algorithms, 2, & 1.585 respectively.

As the polynomials become larger the extra multiplications that the “High School” algorithm compute become more costly because the data is so larger, while the extra additions are a lot less costly for the “Divide & Conquer” Algorithm. Eventually the “Divide & Conquer” & “High School” algorithms take the same amount of time before “Divide & Conquer” becomes much more efficient. The point at which this happens is calculated by setting the two equations together yielding a value of 4,112.073298 for the length of the polynomial. After analyzing these two algorithms one can determine that the reason they cross at the specified point is because that is when the polynomial becomes large enough that the extra multiplications have a large effect on performance.