Algorithms and Data Structures
Winter Term 2015/16
Exercises for Unit 6

1. Spell out the general divide-and-conquer algorithm for multiplying polymomials that was presented in class for the case $b = 2$.

2. Let $T(n)$ be the time necessary to multiply two polynomials of degree less than n. In class we showed that $T(n) = O(n^{\log(2b-1)/\log b})$ for any integer $b > 1$ and thus by choosing b appropriately large $T(n) = O(n^{1+\varepsilon})$ for any $\varepsilon > 0$.

   Show that $T(2^{\binom{k}{2}}) \leq C \cdot k \cdot 2^{\binom{k+1}{2}}$ for some fixed constant $C > 0$, and all integers $k > 1$.

   Hint: make the divide factor b dependent on k.

3. Consider the problem of multiplying two n digit integers. Can polynomial multiplication be of help? What are the relationships between the running times of the algorithms?