1. What does the algorithm MaxSubarray returns when all elements of the array A are negative?
2. Write a pseudocode for Strassen’s algorithm.
3. Use Strassen’s algorithm to compute the matrix product C = AB, where
   \[ A = \begin{bmatrix} 1 & 3 \\ 7 & 5 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 6 & 8 \\ 4 & 2 \end{bmatrix}. \]

   Show all intermediate results!
4. How many lines, as a function of \( n = 2^d \), does the following program print?
   ```
   function f(n)
   if n > 1
       print.line('still going')
       f(n/2)
       f(n/2)
   end if
   ```
5. A k-way merge problem. Suppose you have k sorted arrays, each with \( n \) elements, and you want to combine them into a single sorted array of \( kn \) elements.
   (a) Here’s one strategy: using the Merge in the MERGESORT to merge the first two arrays, and then merge in the third, then merge in the fourth and so on. What is the time complexity of this algorithm, in terms of \( k \) and \( n \)?
   (b) Give a divide-and-conquer algorithm to solve the k-way merge problem, and show the complexity of your algorithm.
6. The standard algorithm for multiplying two \( n \)-bit binary integers \( x \) and \( y \) costs \( \Theta(n^2) \). A naive divide-and-conquer algorithm is to let \( x = 2^{n/2}a + b \) and \( y = 2^{n/2}c + d \), then
   \[ xy = (2^{n/2}a + b)(2^{n/2}c + d) = 2^n ac + 2^{n/2}(ad + bc) + bd \]

   The complexity is \( T(n) = 4T(\frac{n}{2}) + \Theta(n) = \Theta(n^2) \). There is no improvement to the standard algorithm.
   (a) By observing that
   \[ ad + bc = (a + b)(c + d) - (ac + bd), \]
   we can use only three multiplications. Describe this divide-and-conquer algorithm in a pseudocode.
   (b) What is the complexity of the algorithm.
   (c) Illustrate the algorithm for multiplying integers \( x = 10011011 \) and \( y = 10111010 \) (just show one level of the recursion).