1. What does the algorithm `MaxSubarray` returns when all elements of the array `A` are negative?

2. 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 intermediate results.

3. Write a pseudocode for Strassen's algorithm.

4. Use the divide-and-conquer integer multiplication algorithm to multiply the two binary integers 10011011 and 10111010.

5. How many lines, as a function of n (in $\Theta(\cdot)$ form), does the following program print? Write a recurrence and solve it. You may assume n is a power of 2.

```
function f(n)
if n > 1
    print.line('still going')
    f(n/2)
    f(n/2)
end if
```

6. Let S be an array of n integers such that $S[1] < S[2] < \cdots < S[n]$. (1) Specify an $O(\lg n)$ algorithm which either finds an $i \in \{1, 2, \ldots n\}$ such that $S[i] = i$ or else determine that there is no such i. (2) Justify the correctness and running time of your algorithm.

7. *A k-way merge operation.* 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 more efficient solution to this problem, using divide-and-conquer.