Assignments - III

1. Write the following three programs for matrix multiplication and then compare the time required to execute them for the same input. Assume both the input matrices are square matrices of size $2^k \times 2^k$, for some $k \in \mathbb{N}$. Use $k = 7$ for runtime comparison.
    - Write a program to perform matrix multiplication using a naive approach that is in $O(n^3)$.
    - Write a program to perform matrix multiplication using divide and conquer method, such that, the algorithms is in $O(n^3)$.
    - Implement Strassen's matrix multiplication algorithm.
2. Implement an algorithm to solve the maximum subarray problem using divide and conquer method that takes $O(n \log(n))$ time. Here, n is the length of the array.
3. Implement an algorithm to solve the counting inversion problem using divide and conquer method that takes $O(n \log(n))$ time. Here, n is the number of items that are ranked.
4. Implement an algorithm to solve the closest pair problem using divide and conquer method that takes $O(n \log(n))$ time. Here, n is the number of points on a 2-dimensional plane.
5. Implement Karatsuba algorithm for multiplication.