MET CS 566 - Analysis of Algorithms
Assignment 2 - 20 Points

Please note the honor code policy regarding this Assignment. You may not discuss particular questions or discuss or transmit answers from the assignment with other people, except for the MET CS 566 teaching team.

Please submit to the Gradescope!

Tasks

1. Strassen's algorithm **(3 points)**: Use Strassen's algorithm to compute the following matrix product. Show your work in different computation steps.

$$C = \begin{pmatrix} 1 & 3 \\ 7 & 5 \end{pmatrix} \begin{pmatrix} 6 & 8 \\ 4 & 2 \end{pmatrix}$$

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2. Strassen's algorithm **(3 points)**

   Write pseudocode for Strassen's Algorithm.

   You can use similar pseudocode syntax similar to CLRS book or our lectures slides.

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3. Strassen's algorithm **(4 points)**

   Is it possible to use Strassen's Algorithm to compute the following matrix multiplication.

$$C = \begin{pmatrix} 1 & 3 & 2 \\ 7 & 5 & 2 \\ 4 & 2 & 1 \end{pmatrix} \begin{pmatrix} 6 & 8 & 6 \\ 4 & 2 & 1 \\ 5 & 3 & 1 \end{pmatrix}$$

   - Describe how would you compute it.
   - You do not need to calculate it with exact results, just describe how would you do it and describe your steps. (2 points)
   - Is it possible to use Strassen's Algorithm for any matrix multiplication? What is the resulting algorithm run time in Θ notation it? Describe your answers. (2 points)

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4. **Solving the following recurrences (4 points)**

   Use the **Substitution Method** for solving the following recurrences.

   1. Show that the solution of $T(n) = T(n-1) + n$ is $O(n^2)$.
   2. Show that the solution of $T(n) = T(\lceil \frac{n}{2} \rceil) + 1$ is $O(lgn)$.

   Note: $\lceil \rceil$ is ceiling. lgn Is log base 2.

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5. **Solving the following recurrences (6 points)**

   Use the **Master Method** for solving the following recurrences:

   1. $T(n) = 2T(n/4) + 1$
   2. $T(n) = 2T(n/4) + \sqrt{n}$
   3. $T(n) = 2T(n/4) + n^2$