CECS 528, In Class Assignment 2, January 30th, 2026, Dr. Ebert

Directions.

1. Form a group with two other students and solve each of the following three problems.
2. Each student is responsible for i) handwriting a solution to one of the problems on a separate sheet of paper, and ii) providing feedback to the other two students regarding their solutions.
3. In addition to the solution, each page should also include i) the problem number, ii) name of the author, and iii) signatures from the other two students. By signing the page, each of the other two students are certifying that they either approve of the solution and/or have offered constructive feedback to the author.
4. All three pages should be turned in before leaving class. Please do *not* staple them, as they will be graded and returned to each author at the next meeting.

Problems

1. Demonstrate Hoare's `Quicksort` algorithm on the array

$$a = 92, 67, 25, 61, 77, 66, 13, 73, 70, 81, 17, 74, 39, 40, 29.$$

   Hint: it is *unncessary* to rewrite the array each time the left and right markers are moved. (10 pts)

2. Work through the Substitution method to prove that the recurrence

$$T(n) = T(\frac{2n}{3}) + T(\frac{n}{3}) + n$$

   implies that $T(n) = \Omega(n \log n)$. (10 pts)

3. On page 13 of the Divide and Conquer lecture, rewrite the inequality just below the "**Claim**", assuming that groups of three are used instead of groups of 5. Use the new inequality to establish a new worst-case recurrence that should very much resemble the recurrence shown in Problem 2. Based on the result of Problem 2, conclude that using groups of three cannot guarantee a worst-case linear number of algorithm steps. (15 pts)