CECS 528, In Class Assignment 2, September 3rd, 2026, Dr. Ebert

Directions. All work should only be shown on this sheet of paper which is to be turned in before the end of class. Each student must write their own portion of the solution and initialize their part. Note: each student is awarded the same amount of points which is equal to the sum of all points earned on the sheet. Both problems are worth 15 points each.

Student 1. Your name: _____

Student 2. Your name: _____

Student 3. Your name: _____

1. Given the divide-and-conquer recurrence

$$T(n) = 2T(n/6) + n^{\log_9 3},$$

in relation to the Master Theorem, do the following.

(a) Student 1: provide $f(n)$.

(b) Student 2: provide a, b and $n^{\log_b a}$, and round $\log_b a$ up to the nearest thousandth.

(c) Student 3, use the Master Theorem to determine the big-Θ growth of $T(n)$. If the case used involves using an ϵ, then provide an appropriate value for ϵ or determine an upper bound for ϵ so that the case can be correctly applied.

2. Suppose $T(n)$ is a strictly increasing function, meaning that $n_1 < n_2$ implies that $T(n_1) < T(n_2)$, for all $n_1, n_2 > 0$. Also, suppose we know that it satisfies the non-uniform recurrence

$$T(n) = 4T(n/3) + 5T(n/4) + \sqrt{n} \cdot n.$$

Students 1, 2, and 3, discuss among yourselves how you can use the provided information along with the Master Theorem to compute a "good" (or at least the best you can do using the given information and the Master Theorem) big-Ω estimate for the growth of $T(n)$.

(a) Student 1: provide a few sentences that explains your group's approach (but do not give the resulting divide-and-conquer recurrence).

(b) Student 2: provide the divide-and-conquer recurrence that is a result of the group's approach. Show all work.

(c) Student 3: solve Student 2's recurrence using the Master Theorem. Show all work.