Fall 2024
Exam I (scaled to 25 pts)
Thursday, October 3

DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO

Name:_____. Student ID No._____

1. **NO TALKING UNTIL YOU LEAVE THE EXAM ROOM, PERIOD.** Doing so will earn you an F on the exam, at a minimum.
2. You May **NOT ASK ANY QUESTIONS DURING THE EXAM**. Do your best and note any concerns on your page.
3. **Write the exam with a dark colored pen or pencil.** Light colored pens or pencils do not scan well.

A. Answer all questions on these pages. No code or pseudo-code is necessary – just a precise and concise explanation and justification.
B. *Unsupported work will receive no credit.*

- **Plagiarism** will earn you an F in the course and a recommendation of expulsion from the university.
    - **a.** You may not refer to any material outside of this exam.
    - **b.** That is, you may **not** refer to notes, books, papers, calculators, phones, classmates, classmates' exams, and so forth.
    - **c. Do not talk to fellow students at any time while in the exam room.**

Q1 (5 pts) Circle the best representation for $\sum_{i=1}^{n} i$.

a. $\Theta(n)$
b. $\Theta(n \log n)$
c. $\Theta(n^2)$
d. $\Theta(n!)$

Justify your answer.

Q2 (6 pts) Given n values stored in a singly-linked list on a RAM:

a. What is the asymptotic running time of Mergesort?

b. What is the asymptotic running time of Quicksort?

Justify your answers.

Q3 (7 pts) Given n data items stored in the global memory of a CREW PRAM, give an asymptotically cost-optimal algorithm with asymptotically optimal running time to determine the sum of all n values. At the conclusion of your algorithm, every processor must know the final result. Justify your answer.

Q4 (7 pts) Given n data items distributed one per processor on a linear array of size n, give an asymptotically optimal algorithm to sort the data. Give the details of your algorithm. Justify your answer.

Extra Credit

(1 Pt) What professional football team does Dr. Miller root for?

a. New England Patriots
b. San Francisco 49ers
c. New York Giants
d. Philadelphia Eagles

(1 Pt) Where did Dr. Miller grow up?

a. Buffalo
b. San Diego
c. Toronto
d. Long Island