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Recitation: 8

Problem 0

Points:

Acknowledgements

(a) I did not work in a group.

(b) I did not consult without anyone my group members.

(c) I did not consult any non-class materials.

Problem 1 **Points:**

Analyze Running Time

1. **Runtime:** $\theta(n^2)$

   When $i = 1$, then $j = 1$. Here, while loop runs for $\frac{n-1}{5}$ times.

   When $i = 2$, then $j = 2$. Here, while loop runs for $\frac{n-2}{5}$ times.

   $\vdots$

   When $i = (n-5)$, then $j = (n-5)$. Here, while loop runs for 1 time.

   $\vdots$

   When $i = (n-1)$, then $j = (n-1)$. Here, while loop runs for 1 time.

   Total time: $\frac{n-1}{5} + \frac{n-2}{5} + \ldots + \frac{5}{5} + 1 + 1 + 1 + 1 + 1 \Rightarrow \theta(n^2)$

2. **Runtime:** $\theta(n^2)$

   When $i = 1$, then while loop runs from 4 to n. Time $= (n-4)$

   When $i = 2$, then while loop runs from 8 to n. Time $= (n-8)$

   $\vdots$

   When $i = \frac{n}{4}$, then while loop will run 1 time. Time $= 1$

   For loop will run for total of n times.

   $\Rightarrow \theta(n^2)$

3. **Runtime:** $\theta(nlogn)$

   The main while loop will run for $\theta(logn)$ time as i is reduced to its half after every iteration.

   The inner for loop will run for $\frac{n}{2} + \frac{n}{2^2} + \frac{n}{2^3} + \ldots + 1 = \theta(n)$

   So, total time $\Rightarrow \theta(nlogn)$

Problem 2

Points:

Polynomials and Horner's rule

(a)

(b)

(c)

Problem 3

Points:

Solving recurrences

(a)

(b)

(c)

(d)

(e)