

Hands On #4

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CSE 5311.006

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Problem 0:

Call Stack: $\text{fib}(5) \rightarrow \text{fib}(4) \rightarrow \text{fib}(3) \rightarrow \text{fib}(2) \rightarrow \text{fib}(1)$
 $\rightarrow \text{fib}(0) \rightarrow \text{fib}(1) \rightarrow \text{fib}(2) \rightarrow \text{fib}(1) \rightarrow \text{fib}(0)$
 $\rightarrow \text{fib}(3) \rightarrow \text{fib}(2) \rightarrow \text{fib}(1) \rightarrow \text{fib}(0) \rightarrow \text{fib}(1)$

Problem 1:

$$T(N) = 1 + K + 10NK + 1$$

$$= 2 + 11NK$$

$$0 \leq \frac{1}{2}NK \leq 2 + 11NK \leq 500NK$$

$$0 \leq \frac{1}{2} \leq \frac{2}{NK} + 11 \leq 500$$

$$0 \leq \frac{1}{2} \leq 11 \leq 500$$

{ Division by NK }

{ Applied $\lim_{N \rightarrow \infty}$ }

Hence, $\Theta(NK)$

I could've used a min-heap that would have reduced the time complexity to some logarithmic time.

Problem 2:

$$T(N) = 2 + 3N$$

$$0 \leq \frac{1}{2}N \leq 2 + 3N \leq 50N$$

$$0 \leq \frac{1}{2} \leq \frac{2}{N} + 3 \leq 50 \quad (\text{Division by } N)$$

$$0 \leq \frac{1}{2} \leq 3 \leq 50 \quad (\text{Applied limit } N \rightarrow \infty)$$

Hence, $\Theta(N)$

This algorithm is already time-optimal but uses additional space. Inplace dedupe could prevent that.