Quiz Submissions - Fall 2021 Quiz 02

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Exit Preview

Attempt 1

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Submission View

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Question 1 **0 / 1 point**

What is the tightest runtime of the following recurrence:

$$T(n) = nT(n-1)$$

- ➡ ○ $O(n!)$
- ○ $O(n^n)$
- ○ $O(n^2)$
- ○ $O(2^n)$

Question 2 **0 / 1 point**

What is the tightest runtime of the following recurrence: $T(n) = \sqrt{n} * T(\sqrt{n})$

- ○ $O(n^{\frac{3}{2}})$
- ○ $O(n \log n)$
- ○ $O(\sqrt{n})$

- $O(\log \log n)$
- ➡ $O(n)$

Question 3 **0 / 1 point**

What is the tightest runtime of the following recurrence: $T(n) = T(2n/7) + c$

- $O(n \log n)$
- $O(n)$
- ➡ $O(\log n)$
- $O(1)$

Question 4 **0 / 1 point**

Which of the recurrences below can be solved using Case 1 of the Master Theorem? Assume that n is "nice" and $T(1) = 1$

- ➡ ✖ ☐ $T(n) = 9T(n/3) + 2n$
- ✔ ☐ $T(n) = 3T(n/9) + n^{0.53}$
- ✔ ☐ $T(n) = 3T(n/4) + 2n \log n$
- ➡ ✖ ☐ $T(n) = \sqrt{2} * T(n/2) + log(n)$

Question 5 **0 / 1 point**

Which of the recurrences below can be solved using the Master Theorem?

- [x] $T(n) = T(\sqrt{n})$
- [x] $T(n) = T(n) + \sqrt{n}$
- [x] $T(n) = T(n-1) + T(n-2)$
- [ ] $T(n) = T(n/3) + n \log n$

Question 6 **0 / 1 point**

Given an array of size n with exactly one inversion, one can find the inversion in what time? Select the tightest bound

- ( ) $O(\log n)$
- ( ) $O(\sqrt{n})$
- ( ) $O(n \log n)$
- ( ) $O(n)$
- ( ) $O(1)$

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We can do a linear time scan to find the element-pair that is out of order

Question 7 **0 / 1 point**

A divide and conquer algorithm recursively solves 7 problem instances, each of size n/3,

and merges these solutions in O(n^3) time. What is the asymptotic tight runtime of this algorithm?

- ○ $O(n^3)$
- ○ $O(n^{\log_3 7})$
- ○ $n^{4 \log n}$
- ○ $O(n^{\log_7 3})$

Question 8 **0 / 1 point**

In which pairs of functions (f(n), g(n)) does f(n) grow **polynomially** slower?

- ☒ $(\sqrt{n \log n}, n \log n)$
- ☑ $(\log \log n, \log n)$
- ☒ $(n^{\log_3 9}, n^3)$
- ☑ $(n^4, n^4 \log n)$

Question 9 **0 / 1 point**

What is the worst-case runtime for finding the index of a value k in an array A that is sorted except for two inversions? All array elements are unique.

- ○ $O(\log n)$

- $O(n)$
- $O(n \log n)$
- $O(1)$

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This can be done with a modified binary search that may have to repeat (at worst, a constant number of times) when it encounters an inversion

Question 10 **0 / 1 point**

Bingley's MergeSort algorithm has a bug. Each merge step inserts a single inversion into the supposedly sorted merged array. What is the runtime of Bingley's algorithm if he were to eliminate the inversion after each merge step instead of debugging his algorithm?

- $O(n^2)$
- $O(n)$
- $O(n^2 \log^2 (n))$
- ➡ $O(n \log n)$

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As noted in the earlier question, we can find (and swap) the inversion in O(n). This would be added to the merge step's runtime, which does not affect the merge step's runtime

Attempt Score:0 / 10 - 0 %

Done