QuizW2

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by Chris

Review Test Submission: Week 02 Quiz

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Subject	Algorithms and Complexity
Test	Week 02 Quiz
Started	7/03/16 4:21 PM
Submitted	7/03/16 4:22 PM
Due Date	16/03/16 5:00 PM
Status	Completed
Attempt Score	5 out of 5 points
Time Elapsed	1 minute
Instructions	You should attempt the quiz after the lecture and your tutorial. • The quiz is available for a period of 10 days. • You may attempt the quiz multiple times (if you happen to get a question wrong, you can do it again) • Your score on the quiz will be recorded in the grade book. The score is not used when determining your final mark in this subject • The quiz might not display equations correctly in some browsers. If you experience problems, we recommend that you use Firefox. **Note:** you must complete at least eight of the weekly quizzes to meet one of the hurdle requirements in this subject
Results Displayed	All Answers, Submitted Answers, Feedback, Incorrectly Answered Questions

Question 1

1 out of 1 points

On my machine, a certain $O(n^2)$ sorting algorithm takes one second to sort 1000 random items. Sorting 100,000 random items can be expected to take:

$(1000)^2 t = 1s$

$(100{,}000)^2 t = 10000 \cdot (1000)^2 t = 10000\ s = 2.78h$

Selected Answer: c. 2-3 hours

Answers:
a. 1-2 minutes
b. 10-15 minutes
c. 2-3 hours
d. about one day
e. almost one year

Response Feedback: That's right. We would expect 100 times as many elements to take 100 x 100 = 10,000 times as long to be sorted.

Question 2

1 out of 1 points

Which of the following claims about growth rate are correct:

Answers:
d. $3n^3 + n\sqrt{n} \in O(n^3)$
a. $(2n \log_2 n)^2 \in O(n^2)$
b. $\sqrt{n} \in O(\log_{10} n)$
c. $\log_2 n \in O(1/\sqrt{n})$
d. $3n^3 + n\sqrt{n} \in O(n^3)$
e. $\sqrt{n} \in O(\sqrt[3]{n})$

$\lim \frac{n^2}{(2n\log n)^2} = \lim \left(\frac{1}{2\log n}\right)^2 = 0.$

$\lim \frac{\log n}{\sqrt{n}} = \lim \frac{n^{-1}}{\frac{1}{2}n^{-\frac{1}{2}}} = \lim \frac{1}{\frac{1}{2}\sqrt{n}} = 0.$

$\lim \frac{n^{-\frac{1}{2}}}{\log n} = \lim \frac{-\frac{1}{2}n^{-\frac{3}{2}}}{n^{-1}} = \lim -\frac{1}{2}n^{-\frac{1}{2}} = 0.$

$\lim \frac{n^3}{3n^3 + n\sqrt{n}} = 1$

$\lim \frac{n^{\frac{1}{3}}}{n^{\frac{1}{2}}} = \lim n^{-\frac{1}{6}} = 0$

Response Feedback: That's right, only one of the statements is correct.

Question 3 1 out of 1 points

Which of the following claims are correct:

Selected Answers: $2^{n+1} \in \Theta(2^n)$

$(n+2)^2 \in \Theta(n^2)$

$\log_{10} n \in \Theta(\log_2 \sqrt{n})$

Answers: $2^{n+1} \in \Theta(2^n)$ $\lim \frac{2^n}{2^{n+1}} = \frac{1}{2}$

$n^{2n} \in \Theta(n^n)$ $\lim \frac{n^n}{n^{2n}} = \lim \frac{1}{n^n} = 0.$

$(n+2)^2 \in \Theta(n^2)$ $\lim \frac{n^2}{(n+2)^2} = 1.$

$(\log_{10} n)^2 \in \Theta(\log_2 n)$ $\lim \frac{\log n}{(\log n)^2} = \lim \frac{1}{\log n} = 0.$

$\log_{10} n \in \Theta(\log_2 \sqrt{n})$

Response Feedback: Spot on! Well done. $\lim \frac{\log \sqrt{n}}{\log n} = \lim \frac{\frac{1}{\sqrt{n}} \cdot (\frac{1}{2} n^{-\frac{1}{2}})}{\frac{1}{n}} = \frac{1}{2}$

Question 4 1 out of 1 points

Which of the following claims are correct:

Selected Answers: $\sum_{i=1}^{n} 3^i \in \Theta(3^{n+1})$

$\sum_{i=1}^{n} 3^i \in \Theta(3^{n-1})$

$\sum_{i=1}^{n} 3^i \in \Theta(3^n)$

Answers: $\sum_{i=1}^{n} 3^i \in \Theta(3^{n+1})$

$\sum_{i=1}^{n} 3^i \in \Theta(3^{n-1})$

$\sum_{i=1}^{n} 2^i \in \Theta(3^n)$

$\sum_{i=1}^{n} 3^i \in \Theta(3^n)$

$\frac{a(1-q^n)}{1-q}$ $\sum 3^i = \frac{(3^n-1)3}{2}$ use lim to verify $\in \Theta(3^n), \Theta(3^{n-1}), \Theta(3^{n+1})$

$\sum 2^i = 2(2^n-1) \in \Theta(2^n)$

Response Feedback: That's right.

Question 5 1 out of 1 points

Order these seven functions, from smallest rate of growth to largest:

Answers		Selected Answer	
$3^n + n^2 \log n$	1.	$1000000\, n$	$\Theta(n)$
$\left(\frac{5}{2}\right)^n + \left(\frac{7}{3}\right) n^2$	2.	$n^3 + n^2 \log n$	$\Theta(n^3)$
$1000000\, n$	3.	$n^2 + n^3 \log n$	$\Theta(n^3 \log n)$

$(3n-1)!$	$\left(\frac{7}{3}\right)^n + \left(\frac{5}{2}\right)n^2$ 4.	$\Theta\left(\left(\frac{7}{3}\right)^n\right)$
$n^2 + n^3 \log n$	$\left(\frac{5}{2}\right)^n + \left(\frac{7}{3}\right)n^2$ 5.	$\Theta\left(\left(\frac{5}{2}\right)^n\right)$
$n^3 + n^2 \log n$	$3^n + n^2 \log n$ 6.	$\Theta(3^n)$
$\left(\frac{7}{3}\right)^n + \left(\frac{5}{2}\right)n^2$	$(3n-1)!$ 7.	$\Theta\left((3n-1)^{3n-\frac{3}{2}}\right)$?

Response Feedback: Perfect! Well done.

Monday, 30 May 2016 11:04:45 PM EST

Levitin's formula

$n! = o(n^{n+\frac{1}{2}})$

seem wrong.

how come $n^n < n!$?

← OK