

CS1356 Introduction to Information Engineering

Quiz 9, 2010/12/13

Your name _____ Student ID _____

1. What are the big-theta notations for the following functions?

(a) $200*N + 0.01*N^4 + 12.35*N*\log_2N$

Ans:

$$\Theta(N^4)$$

(b) $N^{1.1} + N*\log_2N$.

Ans:

$$\Theta(N^{1.1})$$

(Taking $N = 1024^{10}$ for example, $N^{1.1} = 1024^{10}*1024$, $N*\log_2N = 1024^{10}*10*10$)

(c) $N*(N-1)*(N-2)/6$

Ans:

$$\Theta(N^3)$$

2. Let A be a sorted array in the **descending order**. <=降序

(a) Describe the **binary search** algorithm to find a TargetValue in A

Contrast between the homework11 and this question, because the order is different.

(b) If there are 1024 numbers in A, how many comparisons is needed to find the TargetValue?

Ans:

10(11)

(c) Prove that if the TargetValue is in A, then the binary search algorithm will find it.

Ans: (the same as Homework11)

```
procedure Search (List, TargetValue)
if (List empty)
then
  (Report that the search failed.)
else
  [Select the "middle" entry in List to be the TestEntry;
  Execute the block of instructions below that is
  associated with the appropriate case.
  case 1: TargetValue = TestEntry
    (Report that the search succeeded.)
  case 2: TargetValue < TestEntry
    (Apply the procedure Search to see if TargetValue
    is in the portion of the List preceding TestEntry,
    and report the result of that search.)
  case 3: TargetValue > TestEntry
    (Apply the procedure Search to see if TargetValue
    is in the portion of List following TestEntry,
    and report the result of that search.)
] end if
```

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