CS 173, Fall 2016
Examlet 11, Part B

NETID:

FIRST:	**LAST:**

Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

(15 points) Check the (single) box that best characterizes each item.

$T(1) = d$
$T(n) = 2T(n/2) + c$

$\Theta(n)$ [√] $\Theta(n \log n)$ [ ] $\Theta(n^2)$ [ ] $\Theta(2^n)$ [ ]

The running time of binary search is recursively defined by $T(1) = d$ and $T(n) =$

$T(n/2) + c$ [√] $T(n/2) + cn$ [ ]

$2T(n/2) + c$ [ ] $2T(n/2) + cn$ [ ]

For a problem to satisfy the definition of NP, a "yes" answer must have a succinct justification.

true [√] false [ ]

Finding a value in a sorted array is $\Theta(2^n)$.

true [ ] false [√]

The Marker Making problem can be solved in polynomial time.

true [ ] false [ ] not known [√]

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(15 points) Check the (single) box that best characterizes each item.

$T(1) = d$
$T(n) = T(n-1) + n$

$\Theta(n)$ ☐ $\Theta(n^2)$ ☑ $\Theta(n \log n)$ ☐ $\Theta(2^n)$ ☐

$T(1) = d$
$T(n) = 4T(n/2) + n$

$\Theta(n)$ ☐ $\Theta(n \log n)$ ☐ $\Theta(n^2)$ ☑
$\Theta(n^{\log_3 2})$ ☐ $\Theta(n^{\log_2 3})$ ☐ $\Theta(2^n)$ ☐

Problems in class P (as in P vs. NP) require exponential time

true ☐ false ☑ not known ☐

The running time of the Towers of Hanoi solver is $\Theta(n!)$

true ☐ false ☑

Producing all parses for a sentence requires exponential time.

true ☑ false ☐ not known ☐

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(15 points) Check the (single) box that best characterizes each item.

$T(1) = d$
$T(n) = T(n/2) + n$

$\Theta(n)$ [√] $\Theta(n \log n)$ [ ] $\Theta(n^2)$ [ ] $\Theta(2^n)$ [ ]

Algorithm A takes 2^n time. On one input, A takes x time. How long will it take if I add one to the input size?

$x + 2$ [ ] $2x$ [√] 2^x [ ] x^2 [ ]

Problems in NP need exponential time

true [ ] false [ ] not known [√]

Producing all parses for a sentence.

polynomial [ ] exponential [√] in NP [ ]

The chromatic number of a graph with n nodes can be found in polynomial time.

true [ ] false [ ] not known [√]

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(15 points) Check the (single) box that best characterizes each item.

$T(1) = c$
$T(n) = 2T(n/2) + n$

$\Theta(n)$ ☐ $\Theta(n \log n)$ ☑ $\Theta(n^2)$ ☐ $\Theta(2^n)$ ☐

Algorithm A takes $\log_2 n$ time. On one input, A takes x time. How long will it take if I double the input size?

$x + 1$ ☑ $2x$ ☐ 2^x ☐ x^2 ☐

Problems in class NP (as in P vs. NP) can be solved in polynomial time

true ☐ false ☐ not known ☑

The running time of the Towers of Hanoi solver is $O(n!)$

true ☑ false ☐

The Travelling Salesman Problem

polynomial ☐ exponential ☐ in NP ☑

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(15 points) Check the (single) box that best characterizes each item.

$T(1) = d$
$T(n) = 3T(n/2) + n$

$\Theta(n)$ ☐ $\Theta(n \log n)$ ☐ $\Theta(n^2)$ ☐
$\Theta(n^{\log_3 2})$ ☐ $\Theta(n^{\log_2 3})$ ☑ $\Theta(2^n)$ ☐

The running time of the Towers of Hanoi solver is recursively defined by $T(1) = d$ and $T(n) =$

$2T(n-1) + c$ ☑ $2T(n-1) + cn$ ☐
$2T(n/2) + c$ ☐ $2T(n/2) + cn$ ☐

For a problem to satisfy the definition of NP, a "no" answer must have a succinct justification.

true ☐ false ☑

The solution to the Tower of Hanoi puzzle with n disks requires $\Theta(2^n)$ steps

true ☑ false ☐ not known ☐

The Marker Making problem can be solved in polynomial time.

true ☐ false ☐ not known ☑

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(15 points) Check the (single) box that best characterizes each item.

$T(1) = d$
$T(n) = T(n-1) + c$ — $\Theta(n)$ [√] $\Theta(n \log n)$ [ ] $\Theta(n^2)$ [ ] $\Theta(2^n)$ [ ]

Algorithm A takes n^2 time. On one input, A takes x time. How long will it take if I double the input size? — $x+1$ [ ] $2x$ [ ] $4x$ [√] x^3 [ ]

Problems in class NP (as in P vs. NP) can be solved in exponential time — true [√] false [ ] not known [ ]

Deciding whether an input logic expression be made true by appropriate choice of input values. — polynomial [ ] exponential [ ] in NP [√]

Marker Making — polynomial [ ] exponential [ ] in NP [√]