

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

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

$T(1) = d$	$\Theta(\log n)$	☐	$\Theta(\sqrt{n})$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐
$T(n) = 2T(n/4) + n$	$\Theta(n^2)$	☐	$\Theta(n^3)$	☐	$\Theta(2^n)$	☐	$\Theta(3^n)$	☐

The running time of mergesort	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

All ways to assign True/False values to n input variables	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

The Travelling Salesman Problem	polynomial	☐	exponential	☐	in NP	☐
------------------------------------	------------	--------------------------	-------------	--------------------------	-------	--------------------------

NP Complete problems require exponential time.	true	☐	false	☐	not known	☐
---	------	--------------------------	-------	--------------------------	-----------	--------------------------

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

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

$T(1) = d$	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐	$\Theta(n^3)$	☐
$T(n) = 3T(n-1) + d$	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐	$\Theta(3^n)$	☐

Dividing a list in half	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

Algorithm A takes n^5 time. On one input, A takes x time. How long will it take if I double the input size?

$2x$ ☐ $5x$ ☐ $32x$ ☐ x^5 ☐

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

true ☐ false ☐ not known ☐

Producing all parses for a sentence requires exponential time.

true ☐ false ☐ not known ☐

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

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

$T(1) = d$	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐	$\Theta(n^3)$	☐
$T(n) = 3T(n/2) + d$	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐	$\Theta(3^n)$	☐

Merging two sorted lists	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

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 class NP need exponential time

true	☐	false	☐	not known	☐
------	--------------------------	-------	--------------------------	-----------	--------------------------

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

true	☐	false	☐	not known	☐
------	--------------------------	-------	--------------------------	-----------	--------------------------

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

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

$T(1) = d$	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐	$\Theta(n^3)$	☐
$T(n) = 2T(n/3) + d$	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐	$\Theta(3^n)$	☐

The Towers of Hanoi solver	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

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	☐
---------	--------------------------	------	--------------------------	-------	--------------------------	-------	--------------------------

Deciding if a graph is 2-colorable

polynomial	☐	exponential	☐	in NP	☐
------------	--------------------------	-------------	--------------------------	-------	--------------------------

The Towers of Hanoi puzzle requires exponential time.

true	☐	false	☐	not known	☐
------	--------------------------	-------	--------------------------	-----------	--------------------------

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

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

$T(1) = c$	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐	$\Theta(n^3)$	☐
$T(n) = 3T(n/3) + n$	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐	$\Theta(3^n)$	☐

Karatsuba's integer multiplication algorithm	$\Theta(\log n)$	☐	$\Theta(n)$	☐	$\Theta(n \log n)$	☐	$\Theta(n^2)$	☐
	$\Theta(n^3)$	☐	$\Theta(n^{\log_3 2})$	☐	$\Theta(n^{\log_2 3})$	☐	$\Theta(2^n)$	☐

Finding a value in a sorted array is $\Theta(2^n)$.true ☐false ☐Circuit satisfiability is
NP complete.true ☐false ☐not known ☐The Marker Making problem can be
solved in polynomial time.true ☐false ☐not known ☐

Name: _____

NetID: _____ Lecture: A B

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(6 points) Fill in the missing bits of the recursive algorithm for solving the Towers of Hanoi puzzle.

hanoi(A, B, C : pegs, $d_1, d_2 \dots d_n$: disks) \\ move n disks from peg A to peg B if ($n = 1$) move d_1 from A to B

else

 move d_n from A to B

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

$T(1) = c$

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

$\Theta(n)$

☐

$\Theta(n \log n)$

☐

$\Theta(n^2)$

☐

$\Theta(n^3)$

☐

$\Theta(n^{\log_3 2})$

☐

$\Theta(n^{\log_2 3})$

☐

$\Theta(2^n)$

☐

$\Theta(3^n)$

☐

The running time of
binary search

$\Theta(\log n)$

☐

$\Theta(n)$

☐

$\Theta(n \log n)$

☐

$\Theta(n^2)$

☐

$\Theta(n^3)$

☐

$\Theta(n^{\log_3 2})$

☐

$\Theta(n^{\log_2 3})$

☐

$\Theta(2^n)$

☐

Marker Making

polynomial ☐exponential ☐in NP ☐