$\mathbf{CS}$	173,	Fall	2015	
Exa	mlet	10.	Part	B

FIRST:	LAST:

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

1. (9 points) Fill in key facts about the recursion tree for T, assuming that n is a power of 2.

$$T(4) = 7$$
 
$$T(n) = 5T\left(\frac{n}{2}\right) + n$$

- (a) The height:
- (b) The number of leaves (please simplify):
- (c) Value in each node at level k:

Change of base formula:  $\log_b n = (\log_a n)(\log_b a)$ 

2. (6 points) Write the following functions in the boxes so that f is to the left of g if and only if  $f(n) \ll g(n)$ .

42n!  $7^n$   $100 \log n$   $n \log(n^7)$   $2^{3n}$   $\log(2^n)$   $(n^3)^7$ 

$\mathbf{CS}$	173,	Fall	2015	
Exa	mlet	10	Part	P

FIRST:	LAST:

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

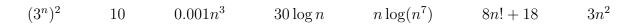
1. (9 points) Fill in key facts about the recursion tree for T, assuming that T is even.

$$T(0) = 5$$
  $T(n) = 3T(n-2) + n^2$ 

- (a) The height:
- (b) The number of leaves (please simplify):
- (c) Value in each node at level k:

Change of base formula:  $\log_b n = (\log_a n)(\log_b a)$ 

2. (6 points) Write the following functions in the boxes so that f is to the left of g if and only if  $f(n) \ll g(n)$ .



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$\mathbf{CS}$	173,	Fall	2015	
Exa	mlet	10,	Part	$\mathbf{B}$

FIRST:	LAST:

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

1. (7 points) Prof. Flitwick claims that for any functions f and g from the reals to the reals, if  $f(x) \ll g(x)$  then  $\log(f(x)) \ll \log(g(x))$ . Is this true? Briefly justify your answer.

2. (8 points) Check the (single) box that best characterizes each item.

$$T(1) = d$$
  

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

$$\Theta(\log n)$$
  $\Theta(n)$ 

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

$$T(1) = d$$
  

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

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

n!

$$O(2^n)$$
 neither of these

 $3^n$  is

$$\Theta(5^n)$$
 neither of these

$\mathbf{CS}$	173,	Fall	2015	
Exa	mlet	10.	Part	F

FIRST:	LAST:

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

1. (9 points) Fill in key facts about the recursion tree for T, assuming that n is a power of 7.

$$T(1) = 5 T(n) = 3T\left(\frac{n}{7}\right) + n^2$$

- (a) The height:
- (b) The number of leaves (please simplify):
- (c) Value in each node at level k:

Change of base formula:  $\log_b n = (\log_a n)(\log_b a)$ 

2. (6 points) Write the following functions in the boxes so that f is to the left of g if and only if  $f(n) \ll g(n)$ .

$$2^{n} + 3^{n}$$
  $n^{3}$   $100 \log n$   $3^{31}$   $3n \log(n^{3})$   $7n! + 2$   $173n - 173$ 

$\mathbf{CS}$	173,	Fall	2015	
Exa	amlet	10.	Part	В

FIRST:	LAST:

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

1. (9 points) Fill in key facts about the recursion tree for T, assuming that n is odd.

$$T(1) = 7 T(n) = nT(n-2) + n$$

- (a) The height:
- (b) The number of leaves:
- (c) Value in each node at level k:

Change of base formula:  $\log_b n = (\log_a n)(\log_b a)$ 

2. (6 points) Write the following functions in the boxes so that f is to the left of g if and only if  $f(n) \ll g(n)$ .

$3n^2$	$\frac{n\log n}{7}$	$(10^{10^{10}})n$	$0.001n^3$	$30\log(n^{17})$	8n! + 18	$3^n + 11^n$
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CS 173, Fa		NE'	TID:	;								
FIRST:					LAST:							
Discussion:	Thursday	2	3 4	' \ <b>1</b>	5	Friday	9	10	11	12	1	2
1. (7 points) Supand $g$ is $O(h)$ .	pose that $f, g, \epsilon$ Must $f$ be $O(h)$						als to	the re	eals, su	ich tha	at $f$ is	is $O(g)$
2. (8 points) Chec	k the (single) bo	ox that	best	char	·acte	erizes each i	$ ext{tem.}$					
	blem of size $n$ i of size $n/m$ , had time when				< m	ı []	k = km	= m  [ $= 1$ [				
T(1) = c $T(n) = 3T(n/3)$	)+n	O(n)		$\Theta(n^2)$	2)	$\Theta(n \log n)$	$\log n$ )		$\Theta(2^n$	)	]	
Suppose $f(n) \ll$ Is $g(n) \ll f(n)$				no	о [	per	rhaps		У	es		
$n^{log_23}$ grows	at the		er thar			slow	er th	an $n^2$				