\mathbf{B}

Name:			

NetID:______ Lecture:

Discussion: Friday 11 12 1 2 3 4

1. (9 points) Fill in key facts about the recursion tree for T, assuming that n is a power of 4.

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

- (a) The height:
- (b) Number of nodes at level k:
- (c) Sum of the work in all the leaves (please simplify):

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

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1. (7 points) You found the following claim on a hallway whiteboard. Suppose that f and g are increasing functions from the reals to the reals, for which all output values are > 1. If f(x) is O(g(x)), then $\log(f(x))$ is $O(\log(g(x)))$. Is this true? Briefly justify your answer.

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

$$T(1) = d$$

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

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

$$\Theta(\sqrt{n})$$

$$\Theta(n^3)$$

$$\Theta(n)$$

$$\Theta(2^n)$$

$\Theta(n \log n)$
$\Theta(3^n)$

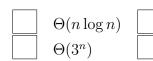
$$T(1) = d$$

$$T(n) = 3T(n/3) + c$$

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

$$\Theta(\sqrt{n})$$

$$\Theta(n^3)$$



$$\log_5 n$$
 is

$$\Theta(\log_3 n)$$

$$O(\log_3 n)$$

Dividing a problem of size n into m subproblems, each of size n/k, has the best big- Θ running time when

$$k = m$$

$$km = 1$$