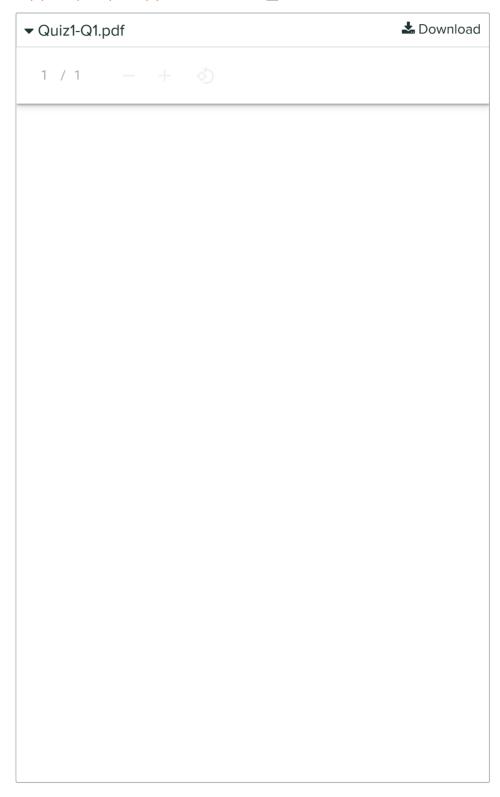
Q1

3 Points

Use a recursion tree to give an asymptotically tight solution to the recurrence

T (n) = T (n - a) + T (a) + cn, where $a \geq 1$ and c > 0 are constants.



Q2 True / False

4 Points

Determine whether the following statements are True or False.

Q2.1

1 Point

if
$$f(n)=n^3+2n^2+3n+4$$
, then $f(n)=O(n^3)$

- True
- OFalse

Q2.2

1 Point

The binary-search recurrence:

$$T(n) = T(n/2 + \Theta(1)$$
, resolves to $T(n) = \Theta(logn)$

- True
- OFalse

Q2.3

1 Point

Using the master method, T(n)=9T(n/3)+n, resolves to $T(n)=\Theta(n^2)$

- True
- OFalse

Q2.4

1 Point

We can use master method to solve the following recurrence:

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





Q3

3 Points

Can the master method be applied to the recurrence $T(n)=4T(n^2)+n^2logn$

Why or why not? Give an asymptotic upper bound for this recurrence.

I think the question should be $T(n) = 4T(n/2) + n^2\log n$. With being that said, no, we can't apply. When we apply to the case 3 of master method, but we can't get any such positive constant ϵ .

Hence, we solve this question as follows:

```
T(n) = 4T(n/2) + n^2 \log n
= 16T(n/2^2) + n^2 \log n + n^2 \log(n/2)
\cdot
\cdot
= 4^{\log n + n^2 [\log n + \log(n/2) + ... + \log(n/2^{\log n})]
= 4^{\log n + n^2 * \log(n^*2/2^* ... * n/2^{\log n})
= n^2 + n^2 * \log(n^{\log n + 1}/2^{\log n}) * (\log n + 1)/2
= n^2 + n^2 * \log(n^{\log n + 1}/2)
= n^2 + n^2 * (\log n + 1)/2 * \log n
```

So, $T(n) = O(n^2\log^2 n)$, we can assume that $T(n) \le C(n \log n)^2$ for some constant C.

Quiz 1-Recurrence	GRADED
STUDENT Kejian Tong	
TOTAL POINTS 9 / 10 pts	
QUESTION 1 (no title)	2 / 3 pts
QUESTION 2	
True / False	4 / 4 pts
2.1 (no title)	1 /1 pt
2.2 (no title)	1 /1 pt
2.3 (no title)	1 /1 pt
2.4 (no title)	1 / 1 pt
QUESTION 3	
(no title)	3 / 3 pts