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15114032 CS-1

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Q 1 $T(n) = 2T(n/2) + n^2$

Q 2 $T(n) = 7T(n/3) + n^2$

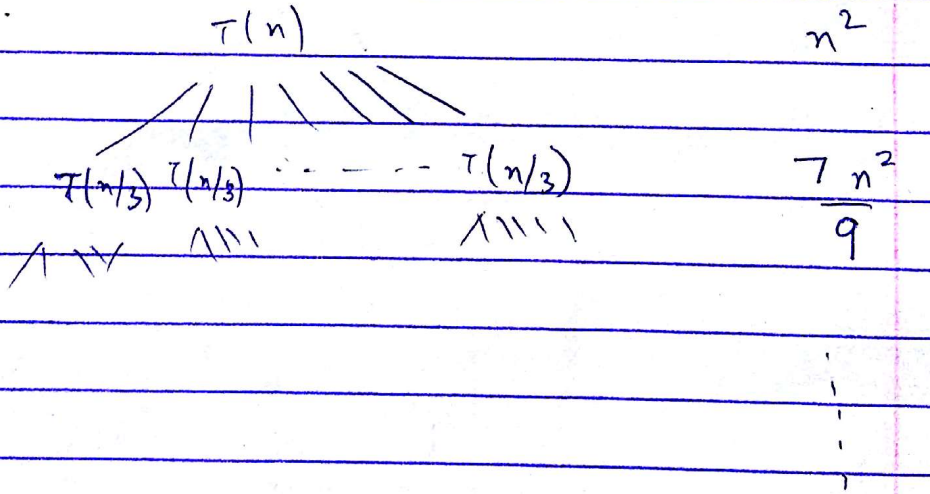
Q 3 $T(n) = 7T(n/2) + n^2$

Q 4 $T(n) = T(n-2) + n^2$

Q 5 $T(n) = 3T(n/3) + n/\log n$

Ans 1 Submitted

Ans 2 $T(n) = 7T(n/3) + n^2$



$$T(n) = n^2\left(1 + \frac{7}{9} + \frac{7^2}{9^2} + \cdots\right)$$

$$T(n) = n^2\left(\frac{1}{1-7/9}\right) = \boxed{9n^2/2}$$

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Ans3 Submitted.

Ans4 $T(n) = T(n-2) + n^2$

$T(n-2) = T(n-4) + (n-2)^2$

$\vdots$

$T(2) = T(0) + 2^2$

$T(n) = n^2 + (n-2)^2 + (n-4)^2 \cdots 2^2$

for even $= \sum_{k=0}^{n/2} (2k)^2 = \frac{n(n+1)(n+2)}{6} = O(n^3)$

for odd $T(n) = \sum_{k=0}^{n} k^2 - \sum_{k=0}^{n/2} (2k)^2$

$= \frac{n(n+1)(2n+1)}{6} - \frac{n(n+1)(n+2)}{6}$

$= \frac{n(n+1)(n-1)}{6}$

$T(n) \equiv O(n^3)$

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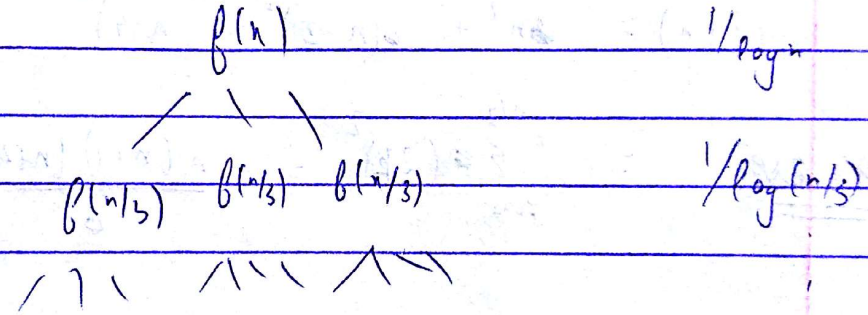
Ans $T(n) = 3T(n/3) + n/\log n$

$f(n) = T(n)/n$

$nf(n) = 3(n/3) f(n/3) + n/\log n$

$f(n) = f(n/3) + 1/\log n$



$$f(n) = \sum_{k=0}^{\infty} \frac{1}{\log(n/3^k)}$$

$$= \Theta\left(\frac{1}{\log n} + \frac{1}{\log n - 1} \cdots\right)$$

$$= \Theta\left(\int_1^{\log n} 1/x\right)$$

$$f(n) = \Theta(\log(\log n))$$

$$T(n) = nf(n) = \Theta(n \log(\log n))$$