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Tutorial - 4

Q1) $T(n) = 3T(n/2) + n^2$

$c = \log_2 3$

$c = 1.584$

$n^c = n^{1.584}$

$f(n) = n^2$

Here, $f(n) > n^c$

$T(n) = \theta(n^2)$

Q2) $T(n) = 4T(n/2) + n^2$

$c = \log_2 4$

$c = 2$

$n^c = n^2$

$f^n = n^2$

Here, $f^n = n^c$

$T(n) = \theta(n^2 \log n)$

Q3. $T(n) = T(n/2) + 2^n$

$c = \log_2 1$

$c = 0$

$n^c = 1$

$f^n = 2^n$

Here, $f^n > n^c$

$T(n) = \theta(2^n)$

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

$c = \log_2 2^n$

$c = n$

$n^c = n^n$

$f^n = n^n$

Here, $f^n = n^c$

$T(n) = \theta(n^n . \log(n))$

5. $T(n) = 16T(n/4) + n$

$c = \log_4 (4)^2$

$c = 2$

$n^c = n^2$

$f(n) = n$

$n^c > f^n$

$T(n) = \theta(n^2)$

6. $T(n) = 2T(n/2) + n \log n$.

$c = \log_2 2$

$c = 1$

$n^c = n$

$f(n) = n \log n$

Here, $f(n) = n^c$

$T(n) = \theta(n . (\log n)^2)$

7. $T(n) = 2T(n/2) + n/\log n$

$c = \log_2 2$

$c = 1$

$n^c = n$

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

$n^c > f(n)$

Here, $T(n) = \theta(n)$

8. $T(n) = 2T(n/4) + n^{0.51}$

$c = \log_4 2$

$c = 0.5$

$n^c = \theta n^{0.5}$

$f^n = n^{0.51}$

$f(n) > n^c$

$T(n) = \theta(n^{0.51})$

9. $T(n) = 0.5T(n/2) + 1/n$

$c = \log_2 0.5$

$c = -1$

$n^c = n^{-1} = 1/n$

$f(n) = 1/n$

$f(n) = n^c$

$T(n) = \theta(1/n)$

10. $T(n) = 16T(n/4) + n!$

$c = \log_4 16$

$c = 2$

$n^c = n^2$

$f(n) = n!$

$f(n) > n^c$

$T(n) = \theta(n!)$

11. $T(n) = 4T(n/2) + \log n$

$c = \log_2 4$

$c = 2$

$n^c = n^2$

$f(n) = \log n$

$n^c = f(n)$

$T(n) = \theta(n^2)$

12. $T(n) = \sqrt{n}\, T(n/2) + \log n.$

$c = \log_2 (n)^{1/2}$

$c = \frac{1}{2} \log n$

$n^c = n^{1/2 \log n}$

$f(n) = \log n$

$f(n) = n^c$

$T(n) = \theta(\log n)$

13. $T(n) = 3T(n/2) + n$

$c = \log_2 3$

$c = 0.581$

$n^c = n^{0.581}$

$f^n = n$

$n^c > f(n)$

$T(n) = \theta(n^{0.581})$

14. $T(n) = 3T(n/3) + \sqrt{3}$

$c = \log_3 3$

$c = 1$

$n^c = n$

$f^n = \sqrt{n}$

$n^c = f^n$

$T(n) = \theta(n)$

15. $T(n) = 4T(n/2) + Cn$

$c = \log_2 4$

$c = 2$

$n^c = n^2$

$f(n) = Cn$

$n^c > f(n)$

$T(n) = \theta(n^2)$

16. $T(n) = 3T(n/4) + n \log n$

$c = \log_4 3$

$c = 0.792$

$n^c = n^{0.792}$

$f^n = n \log n$

$f^n > n^c$

$T(n) = \theta(n \log n)$

17. $T(n) = 3T(n/3) + n/2$

$c = \log_3 3$

$c = 1$

$n^c = n$

$f(n) = n/2$

$n^c > f(n)$

$T(n) = \theta(n)$

18. $T(n) = 6T(n/3) + n^2 \log n$

$c = \log_3 6$

$c = 1.6309$

$n^c = n^{1.63}$

$f^n = n^2 \log n$

$f^n > n^c$

$T(n) = \theta(n^2 \log n)$

19. $T(n) = 4T(n/2) + n/\log n$

$c = \log_2 4$

$c = 2$

$n^c = n^2$

$f^n = \frac{n}{\log n}$

$n^c > f^n$

$T(n) = \theta(n^2)$

20. $T(n) = 64T(n/8) - n^2 . \log n$

$c = \log_8 64$

$c = 2$

$n^c = n^2$

$f^n = -n^2 . \log n$

$f(n) > n^c$

$T(n) = \theta(n^2 \log n)$

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

$c = \log_3 7 = 1.7712$

$n^c = n^{1.77}$

$f(n) = n^2$

$f(n) > n^c$

$T(n) = \theta(n^2)$

22. $T(n) = T(n/2) + n(2 - \cos n)$

$c = \log_2 1$

$c = 0$

$n^c = 1$

$f^n = n(2 - \cos n)$

$f^n > n^c$

$T(n) = \theta(n(2 - \cos n))$