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Assignment 53

1) $O(N)$ or $O(M)$ depending on whether $N > M$ or $M > N$

2) $O(N) * O(N) \rightarrow O(N^2)$

3) $O(n) * O(\log n)$

$\rightarrow O(n \log n)$

4) $O(n) + (O(n) * O(\log n))$

$\rightarrow O(n^2 \log n)$

5) $T(n) = 3T(n/3) + n/2$

$a = 3, \; b = 3, \; k = 1$

$a = b^k \; \& \; p > -1$

$\rightarrow O(n \log^b a \log^{p+1} n)$

$\rightarrow O(n \log^3 3 \log n) \rightarrow O(n \log n)$

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

$a = 6,\ b = 3,\ k = 2 \ \& \ p = 1$

$a < b^k \ \& \ p \geq 0$

$\therefore T(n) = O(n^k \log^p n)$

$= O(n^2 \log n)$

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

$\therefore 4T\left(\frac{n}{2}\right) + n \log^{-1} n$

$a = 4,\ b = 2,\ k = 1,\ p = -1$

$a > b$, so

$T(n) = O(n^{\log_b a})$

$T(n) = O(n^{\log_2 4})$

$T(n) = O(n^2)$

8) $T(n) = 64T\left(\frac{n}{8}\right) - n^2 \log n$

$a = 64,\ b = 8,\ k = 2,\ p = 1$

$\therefore T(n) = O(n^2)$

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

$a=7,\ b=3,\ k=2,\ p=0$

$a < b^k$ & $p \geq 0$

$T(n) = O(n^k \log^p n)$

$\therefore T(n) = O(n^2)$

10) $T(n) = 4T\left(\frac{n}{2}\right) + \log n$

$a=4,\ b=2,\ k=0,\ p=1$

$a > b^k$

$T(n) = O(n^{\log_b a})$

$\therefore T(n) = O(n^{\log_2 4})$

$\therefore T(n) = O(n^2)$

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