Assignment #1

Practice Problem

Master Theorem

1. $T(n) = 2T(n/2) + n$
2. $T(n) = 2T(n/2) + n \log n$
3. $T(n) = 2T(n/2) + n^2$
4. $T(n) = 8(n/2) + n^2$

Simple tricks Master theorem

Case 1 → Greater priority it

$\log_b a > k$ ↳ $\Theta(n^{\log_b a})$

$\log_b a < k$ ↳ $\Theta(f(n))$

Case 3

$\log_b a < k$ → Greater priority it

$\Theta(f(n))$

↳ Denominator ship

↳ No Denominator take all

Case 2 $\log_b a = k$

$p > -1$ → $\Theta(f(n) \log n)^k$

$p = -1$ → $\Theta(f(n) \log \log n)$ → Rare cases

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

$a = 2 \quad k = 1$

$b = 2 \quad p = 0$

$\log_2^2 = 1$

$\log_b a = k$ (case 2)

$p > -1$

$\therefore \Theta(f(n) \log n) \rightarrow \Theta(n \log n)$

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② $T(n) = 2T(n/2) + n \log n$

$a = 2 \quad k = 1$
$b = 2 \quad p = 1$

~~$\log_2^2 = 1$~~
$\log_b a = k$

case 2 : $\log_b a = k$

$p > -1$ (case 2 sub case)
$\therefore \Theta(b(n) \log^{p+1} n)$

i.e $\Theta(n \log n (\log n))$ //

③ $T(n) = 2T(n/2) + n^2$

$a = 2 \quad k = 2$
$b = 2 \quad p = 0$

$\log_b a = \log_2^2 = 1$

$\log_b a < k$ (case 3)

$\Theta(b(n))$
i.e $\Theta(n^2)$

④ $T(n) = 8T(n/2) + n^2$

$a = 8 \quad k = 2$
$b = 2 \quad p = 0$

$\log_2^3 = 3$

$\log_b a > k$ (case 1)

$\therefore \Theta(n^{\log_b a})$

i.e $\Theta(n^3)$ $\log_b a = 3$