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

a = subproblems

n/b = size of sub problem

Strassens

$T(n) = 7(n/2) + \Theta(n^2)$

$f(n) = O(n^{\log_b a - e})$

$f(n) = O(n^{\log_b a \cdot e}) =$

$f(n) = O(n^{\log_b a - \epsilon})$ $\epsilon > 0$ then $T(n) = \Theta(n^{\log_b a})$

$f(n) = \Theta(n^{\log_b a})$ then $T(n) = \Theta(n^{\log_b a} \lg n)$

$f(n) = \Omega(n^{\log_b a + \epsilon})$ $\epsilon > 0$ $a f(n/b) \leq c f(n)$

$c < 1$ and all larger n

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

Regularity condition
$a f(n/b) < c f(n)$

must show Regularity condition for master theorem case 3 to apply

$T(n) = T(2n/3) + 1$

$n^{\log_b a} = n^{\log_{3/2}(1)} = n^0 = 1$

$a = 1$ $\quad f(n) = 1$

$b = \frac{3}{2}$

$f(n) = \Theta(n^{\log_b a}) = \Theta(1)$ equal

$f(n) = 1$

so case 2 of master theorem

$T(n) = 3T(n/4) + n\lg n$

$a = 3$

$b = 4$

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

$n^{\log_b a - \epsilon}$

$= n^{\log_4 3 - \epsilon} = n^{\log(n)}$

no epsilon that makes this true

$n\log(n) = \Omega\, n^{\log_4 3 + \epsilon}$

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$T(n) = 9T(n/3) + n$

$a = 9 \quad f(n) = n$

$b = 3$

$\log_3 9 = n^{2-\epsilon} = n \qquad n^{\log_3(9)} = n^2$

$\epsilon = 1 \qquad n^2 > n$

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

$T(n) = T(2n/3) + 1$

$a = 1 \quad b = 3/2 \quad f(n) = 1$

$\log_{3/2}(1) = n^0 = 1$

r

$f(n) = 1$ $\quad i = 1$ 2nd case

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

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

$a = 3 \quad b = 4 \quad f(n) = n\log(n)$

$n^{\log_4(3)} = n^{.79}$

$n\lg(n) \geq f(n^{+\epsilon})$

$\epsilon = .2$

$T(n) = n\lg(n)$

if

$a\,f(n/b) = 3(n/4)\lg(n/4)$

$\leq (3/4)\,n\lg n$

$\leq c\,f(n)$

$c = 3/4$

~~af(n/b) holds~~

$af(n/b) \leq cf(n)$

holds nothing

$T(n) = n \lg n$

4.5-1

$T(n) = 2T(n/4) + 1$

$a = 2 \quad b = 4 \quad f(n) = 1$