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Algorithms & Data Structures.

Homework #2

Problem 2.2 Recurrences.

a) $T(n) = 36T(n/6) + 2n.$

$\therefore$ Master method since of the form $T(n) = aT(n/b) + f(n).$

$\Rightarrow n^{\wedge}\log_b(a) = n^{\wedge}\log_6 36 \Rightarrow n^2$

$f(n) = 2n.$

$\therefore 2n < n^2$

since the function $f(n)$ is polynomially smaller than $n^{\wedge}\log_b a$

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

b) $T(n) = 5T(n/3) + 17n^{1.2}$

Master method.

$f(n) = 17n^{1.2}$

$n^{\wedge}\log_b a = n^{1.465}$

$\therefore f(n) < n^{1.465}$

$= T(n) = \Theta(n^{1.465})$

c) $T(n) = 12T(n/2) + n^2 \lg n$

$n^{\wedge}\log_b a = n^{3.585}$

$f(n) = n^2 \lg n$

since. $n^{\wedge}\log_b a > fn$

$T(n) = \Theta(n^{3.585})$

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

using the master method.

$3T(n/5) + T(n/2) \approx 11T(n/10)$

$\therefore 11T(n/10) + 2^n$

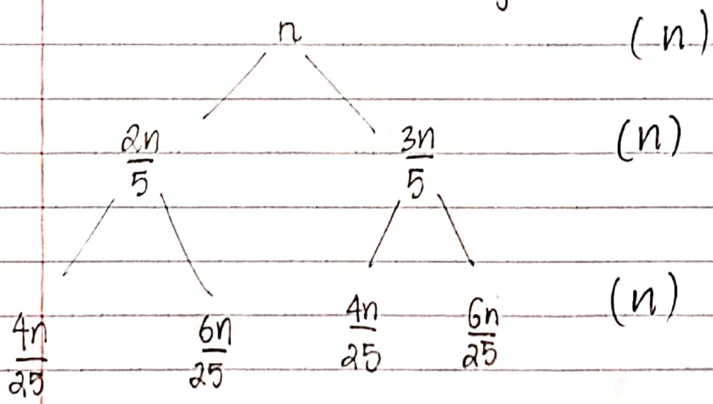
$n^{\wedge}\log_{10}^{11} = n^{1.04}$

since $f(n)$ is polynomially larger than $n^{\wedge}\log_b a$

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

e) $T(n) = T(2n/5) + T(3n/5) + \Theta n$

TREE using a ~~tree~~ recursion tree.



$\therefore T(n) = \Theta(n \log n)$.