算法分析与设计基础作业2

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1.

a.

设$m = lgn$, 则$T(2^m) = 2T(2^{m/2}) + 1$

设$S(m) = T(2^m)$, 则$S(m) = 2S(m/2) + 1$

$\because f(m) = 1 = O(m^{log_2 2-\epsilon})$

$\therefore S(m) = \Theta(m^{log_2 2}) = \Theta(m)$

$\therefore T(n) = S(m) = \Theta(lgn)$

b.

$$
\begin{aligned}
&\because nT(n) = (n-2)T(n-1) + 2 \\
&\therefore T(n) = \frac{n-2}{n}T(n-1) + \frac{2}{n} \\
&\quad = \frac{n-2}{n}(\frac{n-3}{n-1}T(n-2) + \frac{2}{n}) + \frac{2}{n} \\
&\quad = \frac{2}{n(n-1)}T(2) + \frac{2}{n}\sum_{k=1}^{n}\frac{k(k-1)}{n(n-1)} \\
&\quad = \Theta(1)
\end{aligned}
$$