算法设计与分析第二次作业

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2023 年 9 月 22 日

1 3.2-3

Question:

Prove equation (3.19). Also prove that $n! = \omega(x^n)$ and $n! = o(n^n)$

equation(3.19):

$\lg(n!) = \Theta(n\lg n)$

下面证明等式 3.19

$$\begin{aligned}\lg(n!) &= \lg(\sqrt{2\pi n}(\frac{n}{e})^n(1+\Theta(\frac{1}{n}))) \\ &= \lg(\sqrt{2\pi n}) + \lg(\frac{n}{e})^n + \lg(1+\Theta(\frac{1}{n})) \\ &= \frac{1}{2}\lg(2\pi n) + n\lg(\frac{n}{e}) + \lg(1+\Theta(\frac{1}{n})) \\ &= \Theta(\lg n) + \Theta(n\lg n) + \Theta(\frac{1}{n}) \\ &= \Theta(n\lg n)\end{aligned}$$

Q.E.D

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Question: