演算法Homework 20190919

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A screenshot of a social media post

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Proof

The definitions of Θ, o and Ω is below.

Θ (g(n))={f(n): there exist positive constant c and n0 such that 0 ≤ f(n) ≤ cg(n) for all n ≥ n0

o(g(n))={f(n): for any positive constant c> 0, there exists a constant n0 > 0 such that 0 ≤ f(n) < cg(n) for all n ≥ n0

Ω(g(n))={f(n):for any positive constant c and n0 such that 0 ≤ cg(n) ≤ f(n) for all n ≥ n0

At first, a function g(n) belongs to the setΘ(F(n)) if there exist positive constants c1 and c2. g(n) is in the range between c1g(n) and c2g(n).

Secondly, if there exist positive constants c3, the value of function h(n) is below c3h(n) and also c3h(n) can not be equal h(n).

Thirdly, if there exist positive constants c4, the value of function f(n) is always above c4f(n) and also c4f(n) includes the value of f(n).

In addition to them, according to the definitions, every formulas given is positive funtions.

As a result, this equation, f(n) = Ω(F(n)), holds in the given condition.

Proof

I try to prove f(n) = Ω(F(n)) with an analogy below. (text p.52)

the asymptotic comparison of 4 functions f, g, h and F can be replaced with the comparison of real numbers f, g, h and F.

f(n) = g(n) – h(n) f = g – h …①

g(n) = Θ(F(n)) g = F …②

h(n) = o(F(n)) h < F …③

f(n) = Ω(F(n)) f ≥ F …④

Prove that f ≥ F …④ holds.

Substitute g of ② for F of ④.

f ≥ g

Substitute g-h of ② for f of ④.

g-h ≥ g

Calculate them.

0 ≥ h …⑤

Then come back to the definition of o.

o(g(n))={f(n):for any positive constant c> 0, there exists a constant n0 > 0 such that 0 ≤ f(n) < cg(n) for all n ≥ n0

Obviously there is a discrepancy between the definition and ⑤.