CS170–Spring 2022 — Homework 0Solutions

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Collaborators: None

1. Study Group

(a) Has no friend in my study group.

2. Course Policies

(a) I have read and understood the course syllabus and policies.

3. Understanding Academic Dishonesty

(a) Not OK.

(b) Not OK.

(c) Not OK.

(d) OK.

4. In Between Function

Solution: $f(n) = 2^{(logn)^2}$.

(a) For any $n^c = 2^{clogn}$, this is eventually dominated by $2^{(logn)\cdot(logn)}$. So $f(n) = \Omega(n^c)$ for any $c > 0$.

(b) For any $\alpha^n = (2^{log\alpha})^n$, this will dominate $f(n) = 2^{(logn)^2}$ (so long as $\log \alpha$ is positive). So $f(n) = O(\alpha^n)$ for any $\alpha > 1$.

5. Asymptotic Bound Practice

Solution: we can prove this by proving $logx = o(x^\epsilon)$. Here is an alternate argument, using I'Hopital's rule:

$$\begin{aligned} \lim_{x\to\infty} \frac{logx}{x^\epsilon} &= \lim_{x\to\infty} \frac{\frac{d}{dx}logx}{\frac{d}{dx}x^\epsilon} \\ &= \lim_{x\to\infty} \frac{\frac{1}{x}}{\epsilon x^{\epsilon-1}} \\ &= \lim_{x\to\infty} \frac{1}{\epsilon x^\epsilon} = 0 \end{aligned} \tag{1}$$

And therefore $log x \epsilon O(x^{\epsilon})$.

6. Conclusion

(a) For me, using Latex to write the equation is hard. I need to put more effort into the cs170 and latex.

(b) I fail to deal with the task 4 and task 5. I will write them down for reviewing in the future, which play a more significant status in my learning career.