CSE373 Assignment 1

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1 Question 1

1.1 Part 1

We need to prove that

$$\frac{3n^3 + 9n^2 + n - 1}{n^3} \leq c \text{ for all } n \geq 1$$

We know that

$$3 + 9 + 1 - 1 = \frac{3n^3 + 9n^3 + n^3 - 1n^3}{n^3} > \frac{3n^3 + 9n^2 + n - 1}{n^3} \text{ for all } n \geq 1$$

$$12 > \frac{3n^3 + 9n^2 + n - 1}{n^3} \text{ for all } n \geq 1$$

So let constant be 12

$$\frac{3n^3 + 9n^2 + n - 1}{n^3} \leq 12 \text{ for all } n \geq 1$$

Thus $f(n) = O(g(n))$

1.2 Part 2

We need to prove that

$$\frac{5n\log_2 n + 8n - 200}{n\log_2 n} \leq c \text{ for all } n \geq 1$$

We know that

$$5 + 8 - 200 = \frac{5n\log_2 n + 8n\log_2 n - 200n\log_2 n}{n\log_2 n} > \frac{5n\log_2 n + 8n - 200}{n\log_2 n} \text{ for all } n \geq 1$$

$$187 > \frac{5n\log_2 n + 8n - 200}{n\log_2 n} \text{ for all } n \geq 1$$

So let constant be -187

$$\frac{5n\log_2 n + 8n - 200}{n\log_2 n} \leq -187 \text{ for all } n \geq 1$$

Thus $f(n) = O(g(n))$

2 Question 2

The correct order of growth rate is :

- $O(logn)$
- $O(\sqrt{n})$
- $O(n)$
- $O(nlogn)$
- $O(n^1.9)$
- $O(n^2)$
- $O(n^3)$
- $O(2^n)$
- $O(n!)$

3 Question 3

- $O(n^1.1)$
- $O(n^3)$
- $O(n^3)$
- $O(2^n)$
- $O(n^2)$