NYU Computer Science Bridge to Tandon Course Winter 2021

Homework 6 Q5

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Question 5

a: $5n^3 + 2n^2 + 3n = \theta(n^3)$

proof:

if we take $C_1 = 10, C_2 = 5, n_0 = 0$, then for all $n \geq 0$, we have:

$5n^3 \leq 5n^3 + 2n^2 + 3n \leq 5n^3 + 5n^2 \leq 10n^3$

if $n \geq 0$, then the above inequality is true.

b: $\sqrt{7n^2 + 2n - 8} = \theta(n)$

proof:

if we take $C_1 = 3, C_2 = 2, n_0 = 4$, then for all $n \geq 4$, we have:

$2n \leq \sqrt{7}n \leq \sqrt{7n^2} \leq \sqrt{7n^2 + 2n - 8} \leq \sqrt{7n^2 + 2n} \leq \sqrt{9n^2} \leq 3n$

if $2n - 8, n \geq 4$, then the above inequality is true.