NYU, Tandon School of Engineering
Extended Bridge to CS — Summer 2021

Homework #6
Due by Friday 8/20 11:59pm

Submission instructions:

1. For this assignment, you should turn in 5 files:
   - Four '.cpp' files, one for each question 1-4.
     Name your files 'YourNetID_hw6_q1.cpp', and 'YourNetID_hw6_q2.cpp', etc.
   - One '.pdf' file with your answers for question 5.
     Name your file 'YourNetID_hw6_q5.pdf'

2. You must type all your solutions. We will take off points for submissions that are handwritten.

3. **You should submit your homework in the Gradescope system.**

4. **You can work and submit in groups of up to 4 people. If submitting as a group, make sure to associate all group members to the submission on gradescope.**

5. Pay special attention to the style of your code. Indent your code correctly, choose meaningful names for your variables, define constants where needed, choose the most appropriate control flow statements, break down your solutions by defining functions, etc.

Question 5:

Use the definition of Θ in order to show the following:

a. $5n^3 + 2n^2 + 3n = \Theta(n^3)$

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

$Let: f(n) = 5n^3 + 2n^2 + 3n; \quad g(n) = n^3$

Let c=10 c2=5 and $n0$ = 1, therefore for any $n \geq n0$

We have $5n^3 \leq 5n^3 + 2n^2 + 3n \leq 5n^3 + 2n^3 + 3n^3$

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

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

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

$proof.\ Let\ f(n) = \sqrt{7n^2 + 2n - 8}, g(n) = n.\ Let\ c1 = \sqrt{7}, and\ c2 = 3,\ n0 = 1,$

$then\ for\ any\ n \geq n0\ .we\ have:$

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

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

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