NYU, Tandon School of Engineering  
Extended Bridge to CS – Summer 2022  
Homework #6

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**Question 5**

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



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| Step 1   * T(N) = O (f(n)) if and only if there are positive constants c and n0 such that T(N) ≤ cf(N) when N ≥ n0 . * In this case, Thus, . |
| Step 2   * T(N) = Ω (g(n)) if and only if there are positive constants c and n0 such that T(N) ≥ cg(N) when N ≥ n0 . * In this case, . Thus, . |
| Step 3   * T(N) = Θ (h(n)) if and only if T(N) = O(h(N)) and T(N) = Ω (N)). * Since and , in this case, we can conclude that . **∎** |

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| Step 1   * T(N) = O (f(n)) if and only if there are positive constants c and n0 such that T(N) ≤ cf(N) when N ≥ n0 . * In this case, N ≥ 0.936 (3d.p.) * Thus, . |
| Step 2   * T(N) = Ω (g(n)) if and only if there are positive constants c and n0 such that T(N) ≥ cg(N) when N ≥ n0 . * In this case, * Thus, . |
| Step 3   * T(N) = Θ (h(n)) if and only if T(N) = O(h(N)) and T(N) = Ω (N)). * Since and , in this case, we can conclude that . **∎** |