CMPSC 465 Fall 2024

Data Structures & Algorithms
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Recitation 1

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1. **Compare Growth Rates.** Order the following functions by asymptotic growth:

   (i) $f_1(n) = 3^n$
   (ii) $f_2(n) = n^{\frac{1}{3}}$
   (iii) $f_3(n) = 12$
   (iv) $f_4(n) = 2^{\log_2 n}$
   (v) $f_5(n) = \sqrt{n}$
   (vi) $f_6(n) = 2^n$
   (vii) $f_7(n) = \log_2 n$
   (viii) $f_8(n) = 2^{\sqrt{n}}$
   (ix) $f_9(n) = n^3$

2. **Prove Order of Growth.** Prove the following:

   (i) $\sum_{k=1}^{n} k^j = \Theta(n^{j+1})$ for any constant $j > 0$.
   (ii) $\sum_{i=1}^{n} \frac{1}{i} = \Theta(\log n)$