CSE 332: Data Structures and Parallelism

Useful Math Identities

Summations

1. $\sum_{i=0}^{\infty} x^i = \frac{1}{1-x}$ for $|x| < 1$
2. $\sum_{i=1}^{n} cf(i) = c\sum_{i=1}^{n} f(i)$
3. $\sum_{i=0}^{n-1} 1 = \sum_{i=1}^{n} 1 = n$
4. $\sum_{i=0}^{n} i = 0 + \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$
5. $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$
6. $\sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$
7. $\sum_{i=0}^{n-1} x^i = \frac{1-x^n}{1-x}$
8. $\sum_{i=0}^{n-1} \frac{1}{2^i} = 2 - \frac{1}{2^{n-1}}$

In the worst case, if there is an uncommon summation, we recommend using Wolfram Alpha to simplify it.

Logs

A few useful formulas, more can be found on the bottom of these slides

1. $a^{\log_b(c)} = c^{\log_b(a)}$
2. $\log_b(a) = \frac{\log_d(a)}{\log_d(b)}$
3. $\log_b(b) = 1$
4. $\log_b(1) = 0$
5. $b^{\log_b(n)} = n$
6. $\log_b(n \cdot m) = \log_b(n) + \log_b(m)$
7. $\log_b(\frac{n}{m}) = \log_b(n) - \log_b(m)$
8. $\log_b(n^k) = k \cdot \log_b(n)$