

CPS130: Introduction to Algorithms
Homework 1
Due: Tuesday, September 13, 2005

1. Prove that:

a) $10n^3 - 4n + 18$ is $\Theta(n^3)$

b) $\sum_{i=1}^n 1/i$ is $\Theta(\log n)$. This is called the *Harmonic Series*.

c) Using Induction, $\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$ for all $n > 0$.

2. [CLRS] Problem 3-3a. Pick ten (10) of the formulae and order them.

3. Solve the following recurrence relations. Find both upper and lower bounds. Assume that for small values of n , $T(n)$ is a constant. Justify your answers and make your bounds as tight as possible.

a) $T(n) = nT(n-1)$

b) $T(n) = T(n/2) + 3n$

c) $T(n) = 2T(n/2) + 3n$

d) $T(n) = 5T(n/3) + n^2$