CPS130: Introduction to Algorithms
Homework 1
Due: Thursday, January 27, 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 2-4

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

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