CS3933 Assignment 1
Summer 2007

Due: Tuesday, May 8, in class or by 10:00am in the box on E-level .

1. What is the sum $1 + 3 + 9 + \ldots + 3^n$?
2. What is the sum $\sum_{i=0}^{k}(5i + 6)$?
3. The definition of the logarithm function: $\log_b a = x$ means $b^x = a$. Use this definition to prove that $\log_b n / \log_a n = \log_b a$.
4. Use a calculator to calculate $\log_2 10 = \lg 10$ and $\log_e 10 = \ln 10$. These values differ by approximately 1. Show that this implies $\ln n$ is approximately $\lg n - \log_{10} n$ (within 1%). Use this to calculate, without using a calculator, the natural logarithm of 1234567890, to the nearest integer.
5. Prove using induction that for $x \neq 1$,

$$\sum_{i=0}^{n} x^i = \frac{x^{n+1} - 1}{x - 1}$$

6. Prove using induction that $f(n) < 2^n$, where $f(n)$ are the fibonacci numbers defined by $f(0) = 0$, $f(1) = 1$ and for all $n > 1$, $f(n) = f(n-1) + f(n-2)$.
7. Questions 1,2 and 5 from the end of chapter 1 on pages 22-25.