

COS 341, October 4, 2000

Due: October 11, 2000

### Homework Set 3

**Reading Assignments** Finish reading Chapter 5; read Chapter 4.5.

**Written Assignments** Do exercises 5, 10, 18, 28, 37, 43 and 44 in Section 5.8.

**Special Problem** (counted as 1 Exercise).

Let  $n > 1$  be any integer, and for  $1 \leq k \leq n - 1$ , let

$$a_k = \frac{k}{n} \left( \frac{1}{k} + \frac{1}{k+1} + \cdots + \frac{1}{n-1} \right).$$

Prove that there exists  $k_0$  ( $1 \leq k_0 \leq n - 1$  and may depend on  $n$ ) such that

$$a_1 < a_2 < \cdots < a_{k_0} \geq a_{k_0+1} > a_{k_0+2} > \cdots > a_{n-1}.$$

*Remark* You should give a rigorous proof for the statement in Exercise 28. Try to be precise and concise.