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.