

# CS 213

## Homework Assignment 5

**Given:** February 19, 2009

**Due:** February 26, 2009

This assignment is due by the end of the class on the due date. Unless all problems carry equal weight, the point value of each problem is shown in [ ]. To receive full credit all your answers should be carefully justified. Each solution must be the student's own work. Assistance should be sought or accepted only from the course staff. Any violation of this rule will be dealt with harshly.

---

1. Show that, for any  $n$ , there is a sequence of insertions in a max-heap that requires  $\Omega(n \log n)$  time to process.
2. Give an  $O(n \lg k)$ -time algorithm to merge  $k$  sorted lists into one sorted list, where  $n$  is the total number of elements in all the input lists.  
(*Hint:* Use a heap for  $k$ -way merging)
3. Consider a max-heap  $T$  for storing  $n$  keys. Give an efficient algorithm for reporting all the keys in  $T$  that are greater than or equal to a given query key  $x$  (which is not necessarily in  $T$ ). Your algorithm should run in  $O(k)$  time, where  $k$  is the number of keys reported.