This homework is due by 6:00pm on Friday, April 16 in North 01 (you can slide it under the door if necessary). Problem numbers for this assignment refer to [CLRS] (our course textbook).

Problem 1. Problem 16-1 (p. 402).

Problem 2. Problem 30.2-3 (p. 838) **and** problem 30.1-1 (p. 829).

Problem 3. Problem 31.5-1 (p. 876).

Problem 4. (**Extra Credit**) A professor has developed a hardware priority queue for his computer. The priority queue can store up to p records, each consisting of a key and a small amount of data (such as a pointer). The computer to which it is attached can perform Insert and ExtractMin operations on the priority queue, each of which takes $O(1)$ time, no matter how many records are stored in the device. The professor wishes to use the hardware priority queue to help implement a sorting algorithm on his computer. He has n records stored in primary memory of his machine. If $n \leq p$, the professor can certainly sort the keys in $O(n)$ time by first inserting them into the priority queue, and then repeatedly extracting minimum. Design an efficient algorithm for sorting $n > p$ items using the hardware priority queue. Analyze your algorithm in terms of both n and p.