A. Reading assignment
Kleinberg and Tardos, Chapter 7.

B. Problems to turn in (from Kleinberg & Tardos, unless otherwise stated)

1. (10 points) Suppose that a flow network contains a node, other than the source node, with no incoming arc. Can we delete this node without affecting the maximum flow value? Similarly, can we delete a node, other than the sink node, with no outgoing arc?

2. (10 points)
   (a) (5 points) Show that the maximum flow problem with integral capacities has a finite optimal solution if and only if the network contains no infinite capacity directed path from the source node to the sink node.
   (b) (5 points) Suppose that a network has some infinite capacity arcs but no infinite capacity paths from the source to the sink. Let $F$ denote the set of arcs with finite capacities. Show that we can replace the capacity of each infinite capacity arc by a finite number $M \geq \sum_{e \in F} c(e)$ without affecting the maximum flow value.

3. (10 points) Exercise 10, Chapter 7, p. 419.

4. (10 points) Exercise 11, Chapter 7, p. 420.

5. (10 points) Exercise 13, Chapter 7, p. 420.

6. (10 points)
   (a) (4 points) Given a maximum flow in a network, describe an algorithm for determining the minimum cut $(A, B)$ with the property that for every other minimum cut $(C, D)$, $C \subseteq A$.
   (b) (3 points) Describe an algorithm for determining the minimum cut $(A, B)$ with the property that for every other minimum cut $(C, D)$, $A \subseteq C$.
   (c) (3 points) Describe an algorithm for determining whether a flow network has a unique minimum cut.