Algorithms
Computer Science 140 & Mathematics 168
Instructor: B. Thom
Fall 2004
Homework 11a
Due on Thursday, 11/12/2004 (beginning of class)

1. **[20 Points] Walking In the Network-Flow!**

   This problem aims to increase your familiarity with Network-Flow flow graphs—in particular, how capacities, flows, and their constraints change over time as flow is repeatedly pushed along edges for which a path in the residual graph exists. This problem is explained more thoroughly in the accompanying hand-drawn sheets. You should not turn in a Latex copy of your work for this problem—rather use the Xeroxes provided to fill in your answers.

2. **[14 Points] Review of Network Flow Proofs.**

   In class, we'll be proving four fundamental theorems which, in the end, will allow us to show that the network flow algorithms that we will see next time do indeed find maximum flows from s to t. For this assignment, you will re-prove the first three theorems, which we saw in class today:

   (a) The Cut Theorem
   (b) The Capacity Theorem
   (c) The Max-Flow Min-Cut Theorem

   The proofs used in class are easier than those given in the book. Your task is to carefully reconstruct the arguments **made in class!** Your grade in this problem will be based largely on how clearly and precisely you write your proofs.