Problem Set No. 3, Revised

COS 521 Due Oct. 24, 2002
Fall 2002
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1. Give efficient reductions from the uncapacitated transportation problem to the minimum-cost circulation problem, and vice-versa.

2. (Currency Exchange): You are given n different currencies, one of which is $. For each pair of currencies *i,j*, you are given an *exchange rate* x_{ij}, which means that 1 unit of currency *i* can be converted into x_{ij} units of currency *j*, and a maximum conversion amount u_{ij} of currency *i* that can be converted into currency *j*. Finally, you are given *x* initial $.

   (a) Describe a strongly polynominal-time algorithm to maximize the number of $ obtainable via allowed currency exchanges, assuming you are only allowed one currency exchange for each ordered pair *i,j*. Or, show that this problem is NP-hard.

   (b) Describe a polynomial-time algorithm to test whether or not you can realize a profit, allowing arbitrarily many currency exchanges.

   (c) (extra credit) Assume you are allowed to make arbitrarily many transactions. Describe the fastest algorithm you can to determine your maximum profit.