Homework 2
SA405, Fall 2012
Instructors: Foraker and Phillips

Not to be handed in.

1. 2.40 (this is a harder problem then the next three)
2. 2.41
3. 2.42 (Note that this is slightly different then the shortest path presented in class)
4. 2.44
5. Consider a minimum cost flow problem on a network, $G = (V, A)$ with arc costs $\{c_{ij} : (i,j) \in A\}$, arc capacities $\{u_{ij} : (i,j) \in A\}$, and node supply/demands, $\{b_i : i \in V\}$. As discussed in class, the mathematical program associated with this can be formulated using decision variables x_{ij} for each $(i,j) \in A$ as:

$$\begin{array}{lll} \min & \sum\limits_{(i,j)\in A} c_{ij}x_{ij} & \\ \text{s.t.} & \sum\limits_{\{j:(i,j)\in A\}} x_{ij} - \sum\limits_{\{j:(j,i)\in A\}} x_{ji} = b_i & \forall i \in V \\ & 0 \le x_{ij} \le u_{ij} & \forall (i,j) \in A. \end{array}$$

   Using simplex would entail finding a feasible solution to the above problem. Formulate a maximum flow problem that, when solved, can be used to (correctly) generate a feasible flow or indicate that the min. cost flow problem is not feasible.