

Assignment 10

Recall the statement of the decision version of the max flow problem:

FLOW

Input: A graph G with two marked vertices s and t , where every edge e has a capacity c_e , and a parameter k .

Solution: TRUE if there is a flow of value at least k , and FALSE otherwise.

Consider the following flow problem with demands:

FLOW WITH DEMANDS (FWD)

Input: A graph G , a capacity c_e for each edge e , and a demand d_v for every vertex v .

Solution: TRUE if there is a valid flow such that $f^{\text{in}}(v) - f^{\text{out}}(v) = d_v$ for every vertex v , and FALSE otherwise.

Our goal is to show $\text{FWD} \leq \text{FLOW}$.

1. What does that previous sentence mean?
2. Inputs of which problem are we taking, and input of which problem are we outputting?
3. Design an algorithm that computes the reduction (hint: create a source and sink. For every vertex with negative demand, create an edge from the source to it, for every vertex with positive demand create an edge from it to the sink).

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4. Convince me this reduction works.