

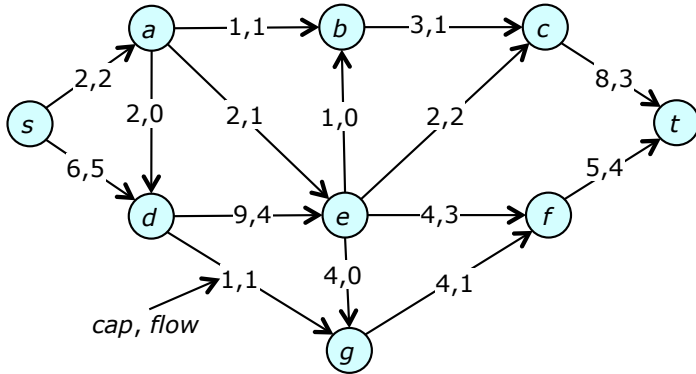
## Review Questions 19

*Your Name:*

Please print out this form (two-sided, if you can) and write your answers *legibly* in the spaces provided. If you can't write legibly, type.

1. Show how the version of the dynamic trees data structure in Figure 3 of *JST19* changes if you do the following operations:  $addcost(f,-2)$ ,  $[foo, fooCost]=findcost(x)$ ,  $cut(foo)$ ,  $link(foo,c)$ ,  $addcost(foo,fooCost)$ .

2. Consider the residual graph shown below. Draw an instance of the dynamic trees data structure that might be used by Dinic's algorithm to represent subtrees with non-zero residual capacity. Make vertices  $c$ ,  $e$  and  $t$  tree roots. Include as many edges in the trees as you can. Show the costs of all non-root vertices.



3. Suppose you implemented the dynamic trees data structure using nothing but an array of parent pointers. What is the worst-case running time of each of the operations, for this implementation?