CMPSCI 311: Introduction to Algorithms **Spring 2018**

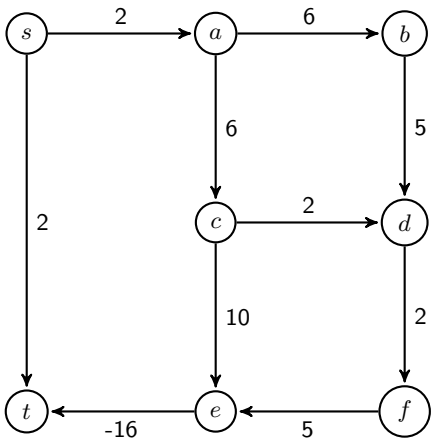
Discussion 7

3/30/2018 Names:

Note: *LaTeX template courtesy of UC Berkeley EECS dept.*

Instructions. List your group members on your worksheet and turn it in at the end of class. Write first and last names. Each group member should turn in their own paper.

1. **Bellman-Ford.**



(a) Find the shortest path from node s to node t.

(b) Add an edge with a weight of -8 going from e to c. What is the minimal path from s to t?

2. **Sequence Alignment.** A friend wants to run sequence alignment on a pair of words v and w. Say that your friend is using a cost matrix C, which specifies the cost for matching any pair of symbols (x, y). You may assume that $C(x, y) = C(y, x)$ for all pairs x, y. Note that $C(x, x)$ may not be equal to zero (In class we always had this equal to zero but it is not necessary in general).

   (a) Write an efficient algorithm that takes the cost matrix C and outputs the maximum integer gap penalty δ that will result in no symbols being matched no matter what the two strings are. Prove correctness and measure runtime. This value for δ will depend on the cost matrix C.

   (b) Write an efficient algorithm that takes a string v and a cost matrix C and outputs a maximal gap penalty δ that will result in no symbols being matched in a matching with v. Prove correctness and measure runtime.