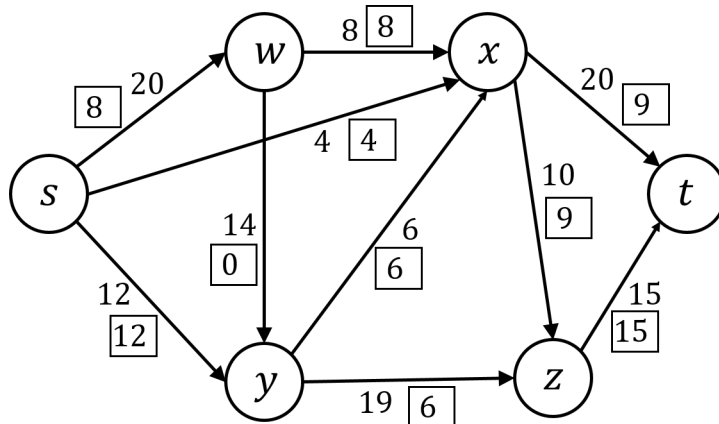


# COSC 311: ALGORITHMS

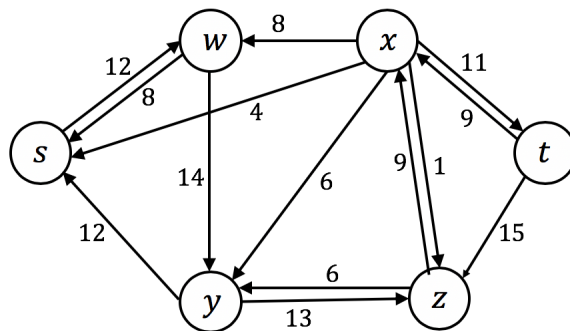
## MINI 9

Due Wednesday, November 7 in class

Here's a graph, where the numbers in boxes represent a flow and the numbers not in boxes represent edge capacities:



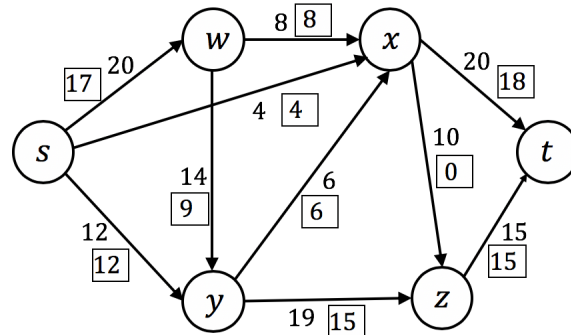
1. **Residual graphs.** Draw the residual graph based on this flow.



2. **Augmenting paths.** State an augmenting path in the residual graph.

An augmenting path, which can carry flow of capacity 9, is given by:  
 $s \rightarrow w \rightarrow y \rightarrow z \rightarrow x \rightarrow t$

**3. Augment.** Show the new flow after you update based on the augmenting path you identified in (2).



**4. Min cuts.** Is the flow you gave in (3) a max flow? Explain why or why not by giving the min cut in this graph.

Yes, the flow given in (3) is a max flow. We know this because the flow given is 33, which matches the capacity of the min cut, which is also 33. The min cut is given by:  $V_1 = \{s, w, y, z\}$  and  $V_2 = \{x, t\}$ .