Algorithms Analysis - Handout 6

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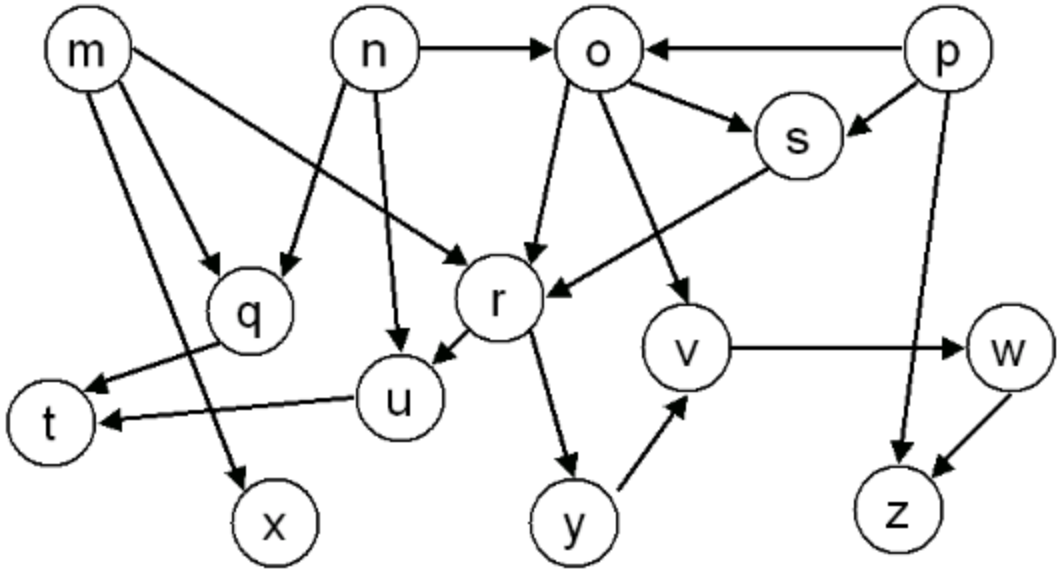
Exercise 1

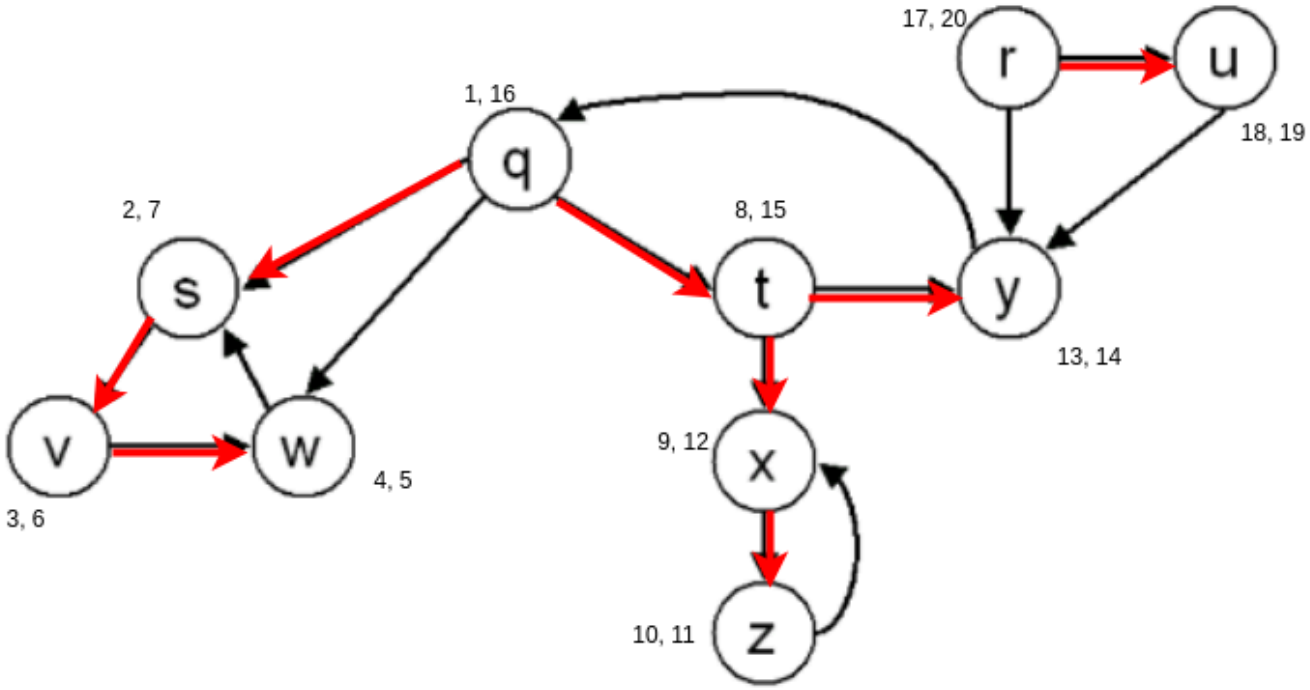


Output of topological sort of the graph above will be:

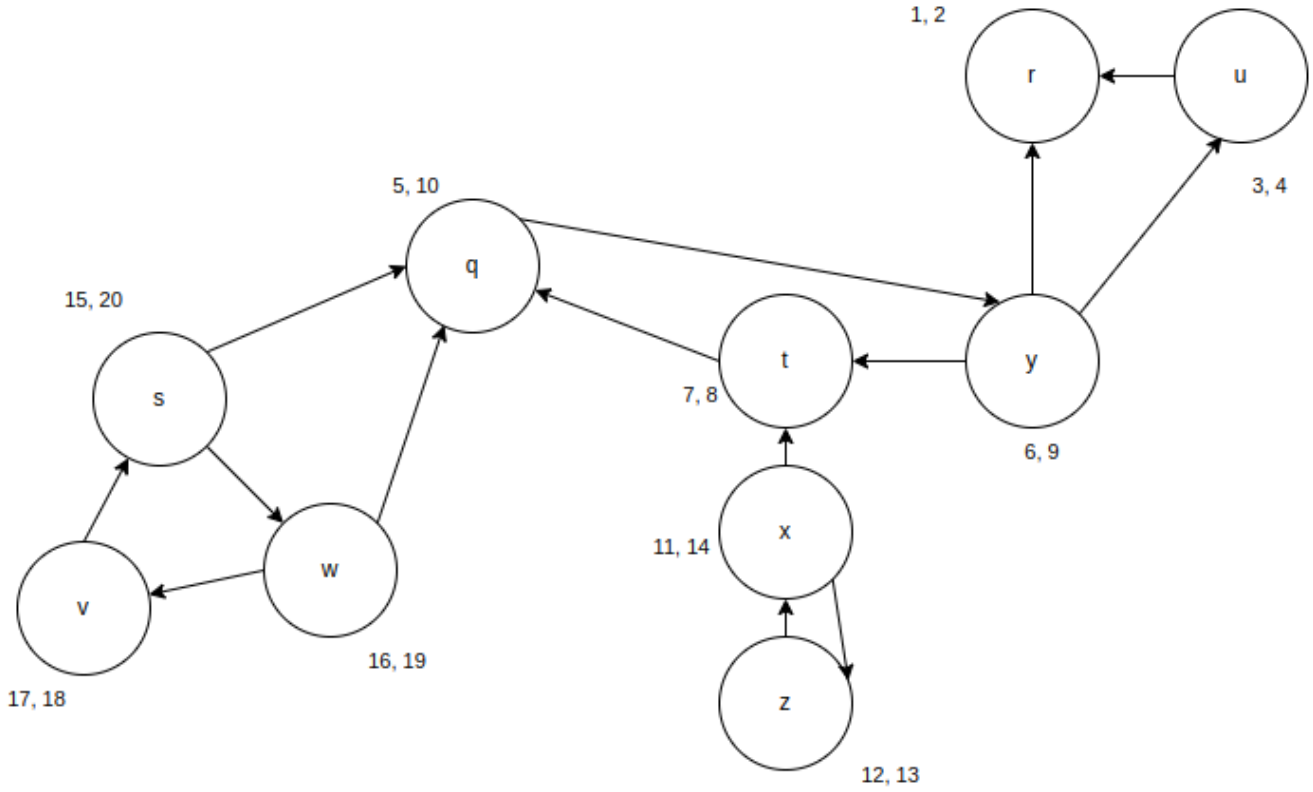
[p, n, o, s, m, x, q, r, y, v, w, z, u, t]

Exercise 2

I can use discovery and finishing times from exercise in previous homework:

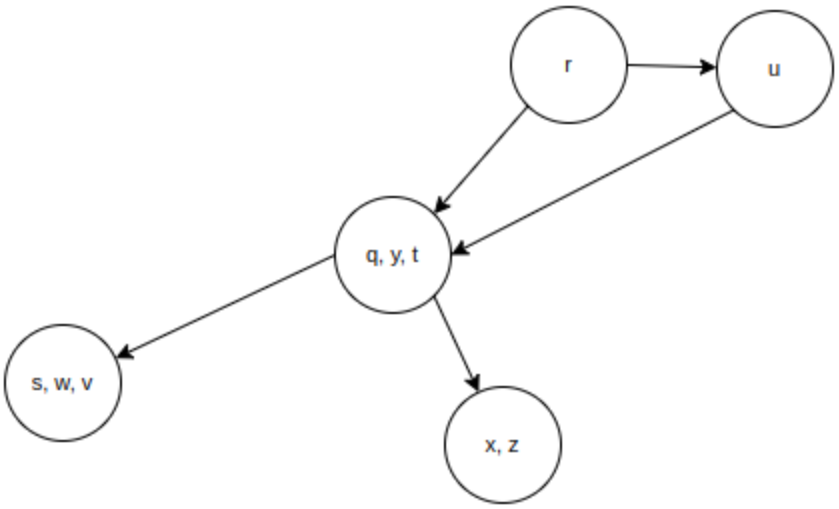


Then, I can compute transposed graph and run DFS on it, considering vertices in decreasing order of finishing times from previous run, giving the following result:



Which gives us separate groups of strongly connected components as follows:

{r} , {u} , {q, y, t} , {x, z} , {s, w, v}



Exercise 3

The number of strongly connected components (SCCs) in a graph either **decreases** or **remains the same** when a new edge is added.

- Number of SCCs **decreases**:
  If the new edge connects two previously separate SCCs, merging them into one.
- Number of SCCs **remains the same**:
  If the new edge connects two vertices already in the same SCC.