Problem Set 4 - Graphs

Problem D

This question I feel like was actually quite intuitable. I was playing around with the concept that, since there are no multiple edges, if we are to traverse through a graph and take all of the edges that complete cycles, the aggregation of these edges will not form cycles themselves. Thus, the maximum amount of colours that we can ever get is 2 - took me a while to come to terms with this, because 1. I was not very good at graph intuition, and 2, felt kind of wrong, because they said k numbering…

Anyhow, with this information, all we needed to do was identify those edges that completed cycles. And to do so, I dfs'ed over the graph recursively, keeping track of the nodes that were currently on the recursion stack using an 'active' node. That way, as I recursed, if I ever found an edge that went to an active node, we know that the edge completes a cycle, and thus, must be coloured too. Otherwise, we colour the edge 1. Finally, since it's directed, and we don't have any given starting point, I just ran the DFS from every node as the start point, skipping the node as a starting point if it's already been seen by the dfs of a previous starting point.

There will never be cycles that contain two distinct nodes that get used as starting points, because if there were, start point 2 would have been seen as part of start point 1's recursion.

Not too bad of a question! I spent most of my time trying to prove to myself that there could only be two colours to be honest. Trivial in retrospect, but I was a goofier and slower version of myself weeks ago.