

## Extra Credit #A

**Due:** January 19, 2024

**Points:** 30

Revision 1, January 23, 2024: (1) The extra credit is worth 30 points, not 100. (2) In the HTML page, part (c) should say “terminal”, not “initial”. The PDF is correct.

Prove or give a counterexample:

The predicate  $can\_share(\alpha, \mathbf{x}, \mathbf{y}, G_0)$  is true if and only if there is an edge from  $\mathbf{x}$  to  $\mathbf{y}$  in  $G_0$  labeled  $\alpha$ , or if the following hold simultaneously.

- (a) There is a vertex  $\mathbf{s}$  with an  $\mathbf{s}$ -to- $\mathbf{y}$  edge labeled  $\alpha$ .
- (b) There is a subject vertex  $\mathbf{x}'$  such that  $\mathbf{x}' = \mathbf{x}$  or  $\mathbf{x}'$  initially spans to  $\mathbf{x}$ .
- (c) There is a subject vertex  $\mathbf{s}'$  such that  $\mathbf{s}' = \mathbf{s}$  or  $\mathbf{s}'$  terminally spans to  $\mathbf{s}$ .
- (d) There is a sequence of subjects  $\mathbf{x}_1, \dots, \mathbf{x}_n$  with  $\mathbf{x}_1 = \mathbf{x}'$ ,  $\mathbf{x}_n = \mathbf{s}'$ , and  $\mathbf{x}_i$  and  $\mathbf{x}_{i+1}$  ( $1 \leq i < n$ ) being connected by an edge labeled  $t$ , an edge labeled  $g$ , or a bridge.