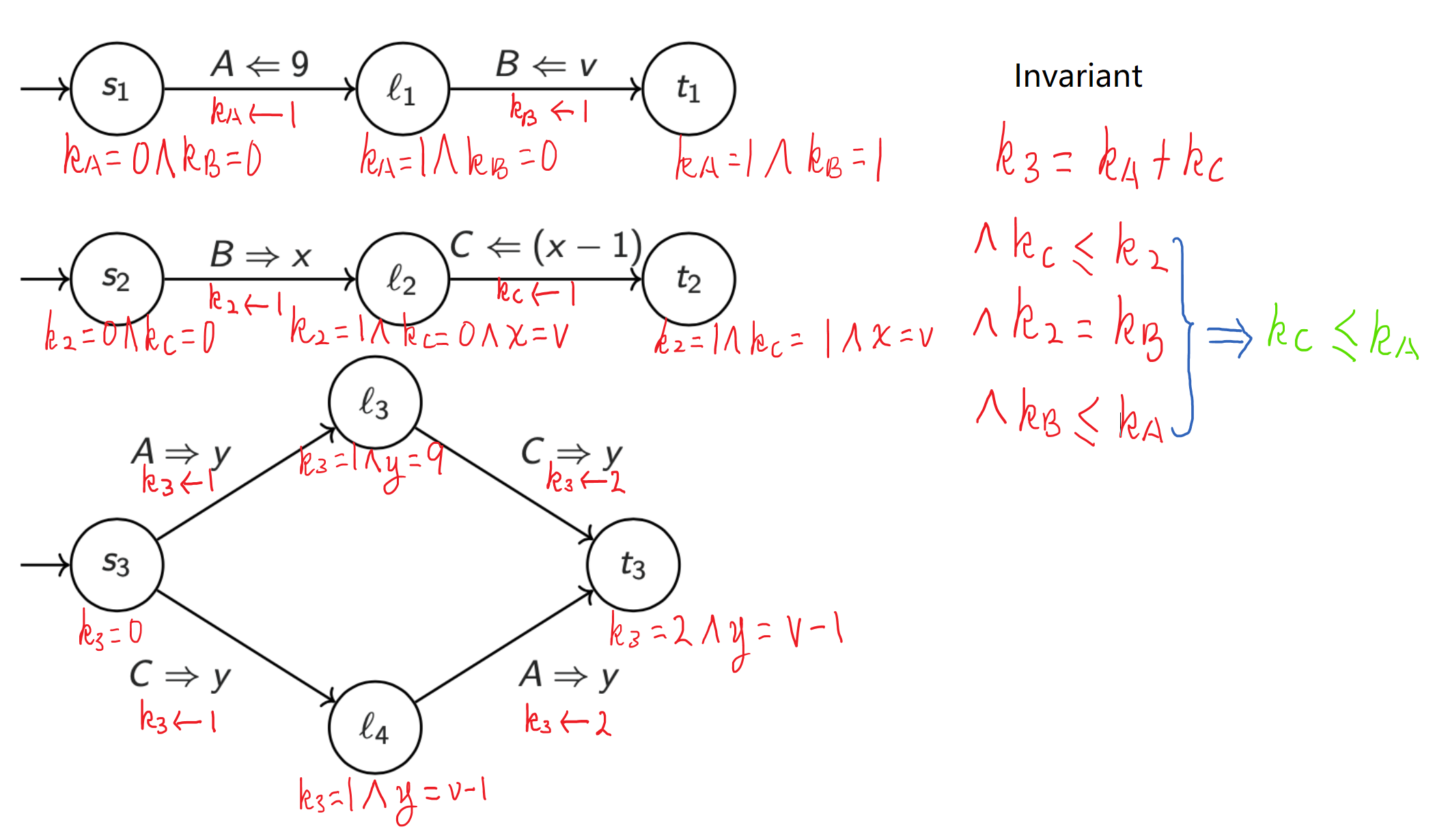
# Homework 7

## Non-compositional Verification



**Diagram for assertion network and communication invariants**

**Explanation of auxiliary variables**

AFR method is used to prove that holds.

Firstly, three variables corresponding to the three channels are defined, which are respectively. is defined as the default state while implies that certain value has been sent into the channel.

Also, we defined to indicate whether process 2 has already received a variable from .

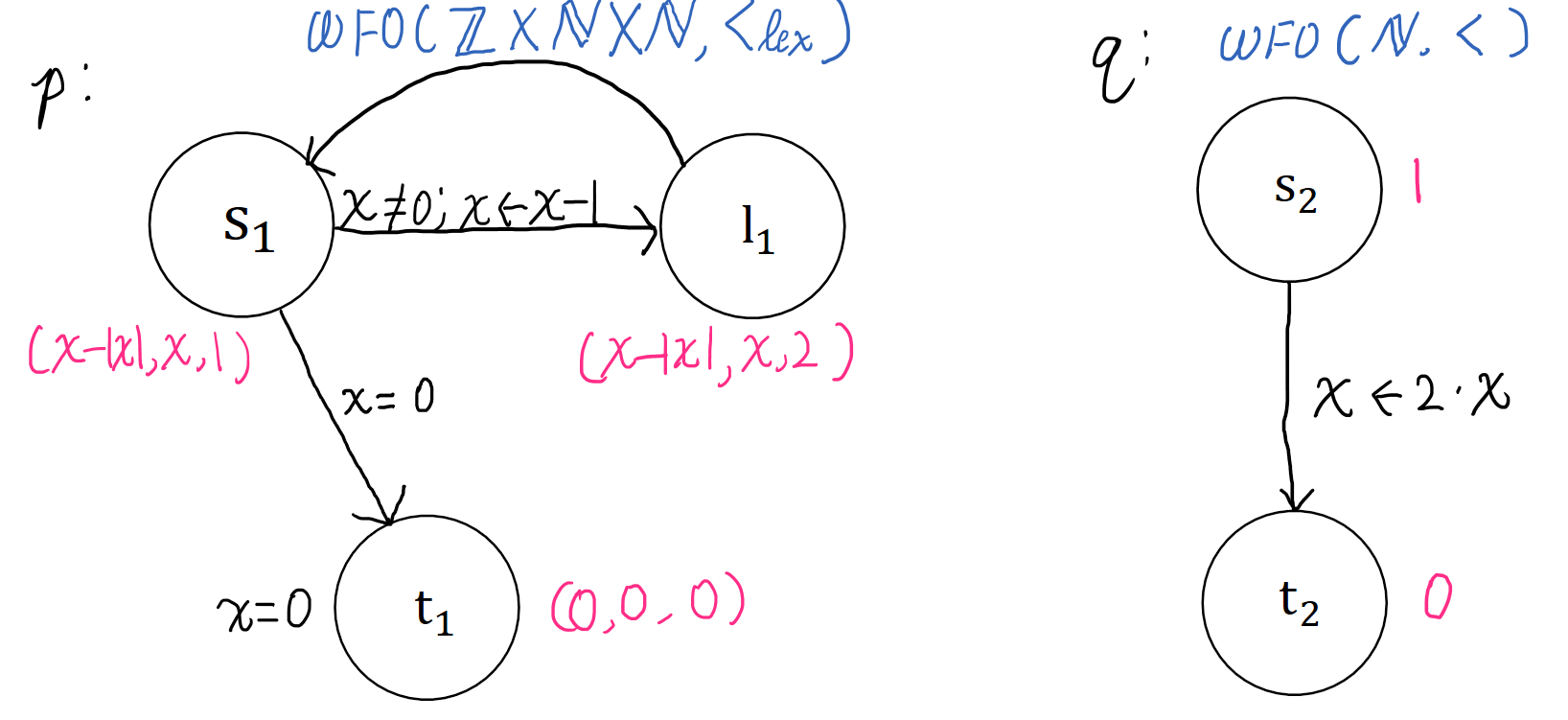
Finally, is defined to record the “stage” of process 3 where .

**Communication invariant**

Notice that implies that , which is useful for discharging proof obligation.

## Termination

***1. prove -convergence***



**Diagram for assertion network, well founded set and ranking function**

For , the program is convergent.

This program exits when then at and at .

***2. Is this program ⊤-convergent?***

No, because for , this program will stay in the loop forever and x will keep going far away the terminate state therefore it never converges.

***2. Is this program ⊥-convergent?***

Yes, because when the precondition is , that means that is false, so