- ▷ Derive axiom 4, that is,  $\Box A \rightarrow \Box \Box A$ , in labK  $\cup$  {t, 5}. Then, show that rule tr is derivable in labK  $\cup$  {t, 5}  $\cup$  {wk<sub>L</sub>, wk<sub>R</sub>}.
- ▶ Derive axiom 5, that is,  $\diamond A \rightarrow \Box \diamond A$ , in labK  $\cup \{b, 4\}$ . Then, show that rule euc is derivable in labK  $\cup \{b, 4\} \cup \{wk_L, wk_R\}$ .
- Write down the labelled rule corresponding to the frame condition of confluence:

$$\forall x, y, z \left( (R(x, y) \land R(x, z)) \to \exists k (R(y, k) \land R(z, k)) \right)$$

Write down the sequent calculus rules corresponding to the axioms of Robinson Arithmetic. Can we use the results from [Negri, 2003] to prove consistency of Robinson Arithmetic? If yes, how?