Homework 3, due Friday 29 February, before 15.00

Note: In general, try to do syntactic proofs informally, not by doing natural deductions.

1. Show that **KC** can be axiomatized by its axioms for atomic formulas only (i.e., we get the same logic if we only add the sentences $\neg p \vee \neg\neg p$ for all propositional letters p).[5 pts]

2. Falsify $[[r \to (((p \to q) \to p) \to p)] \to r] \to r$ on the linear frame of 3 elements. [4 pts]

3.* Show that the three following axiomatization of **LC** are equivalent:

   (a) $\mathbf{IPC} + (\phi \to \psi) \vee (\psi \to \phi)$

   (b) $\mathbf{IPC} + (\phi \to \psi \vee \chi) \to (\phi \to \psi) \vee (\phi \to \chi)$

   (c) $\mathbf{IPC} + [((\phi \to \psi) \to \psi) \wedge ((\psi \to \phi) \to \phi)] \to \phi \vee \psi$.[1] [5 pts]

4. **For students who have taken Introduction to Modal Logic or an equivalent course.**

   Prove that the logic **LC** is complete w.r.t. linear frames. [4 pts]

4. **For students who have not taken Introduction to Modal Logic or an equivalent course.**

   Let A be $\neg p \vee \neg\neg p$. Construct the finite canonical model for A, i.e., give all the consistent theories with the disjunction property of subformulas of A. In which node is A falsified? Do the same thing for $(p \to q) \vee (q \to p)$. [4 pts]

[1] Note that in the syllabus there is an error in the third axiomatization.