September 30, 2009

You must turn in the answers to this homework set as hard-copy on 8\(\frac{1}{2}\) × 11 in. paper, with your name(s) and user name(s) at the top. Staple multiple pages once in the upper-left hand corner. Write extremely neatly. Anything unreadable will be considered incorrect.

1. (3) Using the Fitch-style proof theory presented in lecture, prove that
   \[\vdash A \lor (B \lor C) \Rightarrow B \lor (A \lor C)\]

2. (3) Using the Fitch-style proof theory presented in lecture, prove that
   \[(A \Rightarrow B), (C \Rightarrow D) \vdash A \land C \Rightarrow B \land D\]

3. (3) Using the Fitch-style proof theory presented in lecture, prove that
   \[\vdash (A \Rightarrow B) \Rightarrow (\neg B \Rightarrow \neg A)\]

4. (6) Translate \(\neg (A \land B) \iff \neg C \lor \neg D\) into clause form. Show every step.

5. (3) Using refutation resolution, prove
   \[A \lor (B \lor C) \models B \lor (A \lor C)\]

6. (3) Using refutation resolution, prove
   \[(A \Rightarrow B), (C \Rightarrow D) \models A \land C \Rightarrow B \land D\]

7. (3) Using refutation resolution, prove
   \[(A \Rightarrow B) \models (\neg B \Rightarrow \neg A)\]