RECITATION 1

1. Syllabus

(1) Lectures are Tuesday and Thursday, GHC 4307, from 1:30-2:50.
(2) Recitations are not required but strongly encouraged, taking place on Wednesdays.
(3) Office hours
   - Jon Sterling: Monday 1:30pm-2:30pm, GHC 9225
   - Frank Pfenning: Wednesday, 1:30pm-2:30pm, GHC 7019
   - Ryan Kavanagh, Friday 11:30am-12:30pm, GHC 6207
   - Danny Gratzer, Sat 11:00am-2:00pm, Citadel Teaching Commons, GHC 5th floor
(4) Course homework should be turned via autolab.
(5) Course questions should be asked via Piazza (*Please do not email questions to TAs personally*)
(6) Grades
   - 40% weekly homework, released Tuesday and due Tuesday with no late days.
   - 30% 2 closed-book, in-class midterms, the first being on Thursday September 28th and the second on Thursday, November 9th.
   - 30% the closed-book final.
(7) Grading cut-offs will be no harsher than 90% for an A, 80% for a B, etc.
(8) All of this and more may be found on the course website [http://www.cs.cmu.edu/~fp/courses/15317-f17/](http://www.cs.cmu.edu/~fp/courses/15317-f17/)

2. Review of the Rules Introduced In Class

First let us recall the rules that were introduced in lecture.

\[
\begin{array}{cccc}
A \text{ true} & B \text{ true} & A \text{ true} & B \text{ true} & A \land B \text{ true} & A \lor B \text{ true} & A \land B \text{ true} & A \lor B \text{ true} & A \supset B \text{ true} \\
\hline
A \land B \text{ true} & A \lor B \text{ true} & A \land B \text{ true} & A \lor B \text{ true} & A \land B \text{ true} & A \lor B \text{ true} & A \land B \text{ true} & A \lor B \text{ true} & A \supset B \text{ true} \\
\end{array}
\]

\[
\begin{array}{c}
A \supset B \text{ true} \\
A \text{ true} \\
B \text{ true} \\
A \supset B \text{ true}
\end{array}
\]

3. Example Proofs

(1) \((A \supset (B \supset C)) \supset (B \supset (A \supset C))\)

\[
\begin{array}{c}
A \supset (B \supset C) \quad \bar{A}^c \\
\hline
B \supset C \\
\bar{B}^b \\
\hline
C \\
\bar{C}^c \\
\hline
A \supset C \\
\bar{A}^c_b \\
\hline
B \supset (A \supset C) \\
\bar{B}^b \quad A \supset (B \supset C) \\
\bar{A}^c \quad (A \supset B \supset C) \supset (B \supset (A \supset C)) \bar{a}
\end{array}
\]

*Date: August 30th, 2017.*
(2) \(((A \land B) \supset C) \supset (A \supset (B \supset C))\)

\[
\begin{array}{ccc}
A & B & C \\
\hline \\
\overline{A} & \overline{B} & \overline{C} \\
\hline \\
\overline{A} \land \overline{B} & A & B \\
\hline \\
\overline{A} \land \overline{B} \land C & \overline{A} \land \overline{B} \land C & \overline{A} \land \overline{B} \land C \\
\hline \\
(A \land B) \supset C & A \supset (B \supset C) & (A \supset (B \supset C)) \\
\hline
\end{array}
\]

(3) \(((A \land B) \supset C) \supset (A \supset (B \supset C))\)

\[
\begin{array}{ccc}
A \land B & A \land B \land C & A \land B \land C \\
\hline \\
A & B & C \\
\hline \\
(A \land B) \land C & (A \land B) \land C & (A \land B) \land C \\
\hline \\
(A \land (B \land C)) & (A \land (B \land C)) & (A \land (B \land C)) \\
\hline
\end{array}
\]

(4) \((A \supset (B \land C)) \supset (A \supset B) \land (A \supset C)\)

\[
\begin{array}{ccc}
A & A & A \\
\hline \\
\overline{A} & \overline{A} & \overline{A} \\
\hline \\
\overline{A} \supset (B \land C) & A \supset (B \land C) & A \supset (B \land C) \\
\hline \\
B \land C & B \land C & B \land C \\
\hline \\
A \supset B & A \supset B & A \supset B \\
\hline \\
(A \supset (B \land C)) \supset (A \supset B) \land (A \supset C) & (A \supset (B \land C)) \supset (A \supset B) \land (A \supset C) & (A \supset (B \land C)) \supset (A \supset B) \land (A \supset C) \\
\hline
\end{array}
\]

(5) Why is this impossible with the rules we have? \((A \lor C) \land (B \lor C) \supset ((A \land B) \lor C)\)