CS 3600 – Propositional Logic – Resolution

Suppose we have the following premises:

- If it rains, the aquaphobes will not vote.
- John will win only if the aquaphobes and vegetarians vote
- Either John or Peter will win, but not both

Further suppose, we want to know the following conclusion:

- If it rains, Peter will win

The following are the propositions you should work with

- A: aquaphobes vote
- V: vegetarians vote
- J: John wins
- P: Peter win
- R: it rains

Solve using resolution. Use the following process:

1. Convert the premises to propositional logic
2. Convert the conclusion to propositional logic
3. Negate the conclusion
4. Convert all propositional formulae into conjunctive normal form (CNF)
5. Tabulate individual clauses and use resolution

1. Formulas:

1. $R \rightarrow \neg A$
2. $J \rightarrow (A \wedge V)$
3. $J \leftrightarrow \neg P$

2-3. Negated conclusion formula:

4. $\neg (R \rightarrow P)$

4. Clauses:

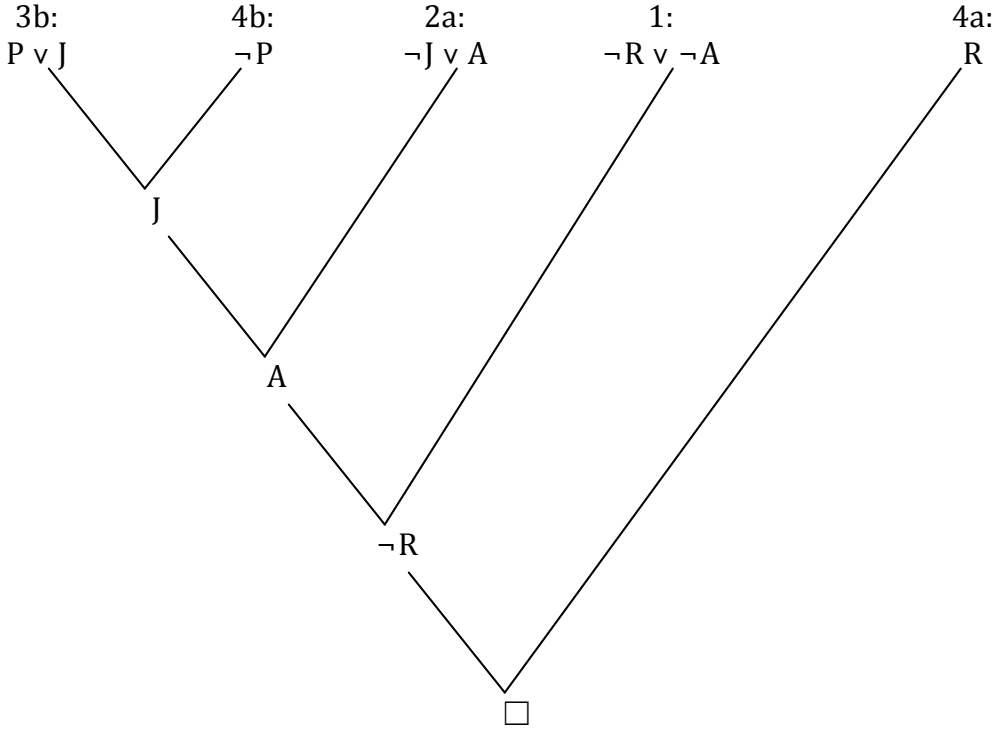
1. $R \rightarrow \neg A$
   $\neg R \vee \neg A$

2. $J \rightarrow (A \wedge V)$
   $\neg J \vee (A \wedge V)$
   $(\neg J \vee A) \wedge (\neg J \vee V)$
   a. $\neg J \vee A$
   b. $\neg J \vee V$

3. $J \leftrightarrow \neg P$
   $(J \rightarrow \neg P) \wedge (\neg P \rightarrow J)$
   $(\neg J \vee \neg P) \wedge (P \vee J)$
   a. $\neg J \vee \neg P$
   b. $P \vee J$

4. $\neg(R \rightarrow P)$
   $\neg(\neg R \vee P)$
   $R \wedge \neg P$
   a. R
   b. $\neg P$

5. Resolution



The negated conclusion is shown to not follow from the premises. Therefore the conclusion is entailed.