CISC301 HW3 Solutions Sketch

After conversion to set of clauses (clausal form), the clauses will be referred to (in left-to-right order) as C1, C2, ...

1. a. Negate and convert to clausal form:

$$\begin{split} [\neg A, (B \rightarrow C)], [A, D], [\neg ((B \rightarrow C) \lor D)] \\ [\neg A, \neg B, C], [A, D], [\neg (B \rightarrow C)], [\neg D] \\ [\neg A, \neg B, C], [A, D], [B], [\neg C], [\neg D] \end{split}$$

Resolve C1 with C3 to get $[\neg A, C]$. Resolve with C4 to get $[\neg A]$. Resolve with C2 to get [D] and resolve with C5 to get [].

b. Negate and convert to clausal form:

...

$$[\neg (A \rightarrow B), (\neg C \rightarrow \neg D), E], [\neg C, E], [\neg E, A], [D], [\neg A] \\ [A, C, \neg D, E], [\neg B, C, \neg D, E], [\neg C, E], [\neg E, A], [D], [\neg A]$$

Resolve C1 with C4 to get $[A, C, \neg D]$. Resolve with [D] to get [A, C]. Resolve with $[\neg A]$ to get [C]. Resolve with $[\neg C, E]$ to get [E]. Resolve with $[\neg E, A]$ to get [A]. Resolve with $[\neg A]$ to get [].

c. Negate and convert to clausal form:

$$\begin{split} & [A], [(\neg B \rightarrow (C \land \neg C))], [\neg A, \neg B] \\ & [A], [B, C], [B, \neg C], [\neg A, \neg B] \end{split}$$

Resolve [B, C] with $[B, \neg C]$ to get [B]. Resolve with $[\neg A, \neg B]$ to get $[\neg A]$. Resolve with [A] to get [].

d. Consider the negation of the conclusion together with the premises and convert to clausal form:

$$\begin{split} & [(A \to (B \to C))], [\neg C], [A], [B] \\ & [\neg A, (B \to C)], [\neg C], [A], [B] \\ & [\neg A, \neg B, C], [\neg C], [A], [B] \end{split}$$

Resolve C1 with [A] to get $[\neg B, C]$. Resolve with [B] to get [C]. Resolve with $[\neg C]$ to get [].