Logic 1, WS 2018. Homework 3, given Nov 6, due Nov 13

1. Transform into DNF:

   (a) $(P \Rightarrow Q) \Rightarrow R$

   (b) $\neg(P \wedge Q) \wedge (P \vee R)$

2. Transform into CNF:

   (a) $(P \Rightarrow Q) \Rightarrow R$

   (b) $(\neg P \wedge Q) \vee (P \wedge \neg Q)$

3. Check the equivalence using a normal form of your choice:

   (a) $(P \Rightarrow Q) \wedge (P \Rightarrow R) \ \models \ P \Rightarrow (Q \wedge R)$

   (b) $(P \Rightarrow Q) \Rightarrow (P \wedge R) \ \models \ (\neg P \Rightarrow Q) \wedge (Q \Rightarrow P)$

4. Show that reduction to DNF is a complete method for proving unsatisfiability.

5. Show by resolution that the following set of clauses is unsatisfiable.

   1. $A \vee B$
   2. $\overline{A} \vee C \vee D$
   3. $C \vee \overline{D}$
   4. $\overline{B} \vee \overline{C}$
   5. $\overline{A} \vee B \vee \overline{C}$
   6. $A \vee \overline{B} \vee C \vee D$

6. Apply DPLL to the set of clauses from exercise 5.