Logic for Computer Science - Week 6 - Exercise Sheet

1. Compute a CNF for the formula $\mathtt{p} \vee \mathtt{q} \to \mathtt{p} \wedge \neg \mathtt{r}$.
2. Give an example of a set of unsatisfiable clauses. The set should contain 3 clauses.
3. Give a derivation of $\square$ from the 3 clauses above.
4. Using resolution, show that the following formulae are valid:
   (a) $\mathtt{p} \wedge \mathtt{q} \to \mathtt{p} \vee \mathtt{q}$;
   (b) $\mathtt{p} \to (\mathtt{q} \to \mathtt{p})$;
   (c) $(\mathtt{p} \to \mathtt{q}) \to (\neg \mathtt{q} \to \neg \mathtt{p})$;
5. Using resolution, prove that the following logical consequences hold:
   (a) $p \models p \vee q$;
   (b) $p \wedge q \models p \vee q$;
   (c) $p \wedge q \to r \models p \to (q \to r)$;
   (d) $p \to p', q \to q' \models (p \wedge q) \to (p' \vee q')$.