

### Logic for Computer Science - Week 5 - Exercise Sheet

1. Bring the following formulae into CNF:

- (a)  $(p \wedge q) \vee r$ ;
- (b)  $(p \vee q) \wedge r$ ;
- (c)  $\neg((p \vee q) \wedge r)$ ;
- (d)  $\neg((p \wedge q) \vee r)$ ;
- (e)  $(p \wedge q) \vee (\neg p \wedge \neg q)$ ;
- (f)  $(p \wedge (q \wedge r)) \vee \neg p$ ;
- (g)  $\neg((\neg(p \wedge q)) \vee (p \vee q))$ ;
- (h)  $(\neg(p \wedge q)) \rightarrow (\neg p \wedge \neg q)$ ;
- (i)  $(p \leftrightarrow (q \rightarrow (\neg p \wedge \neg q)))$ ;
- (j)  $((p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p))$ ;
- (k)  $(p_1 \wedge q_1) \vee (p_2 \wedge q_2) \vee \dots \vee (p_n \wedge q_n)$  (first solve for  $n = 2$  and  $n = 3$ , then generalize);
- (l)  $(p_1 \vee q_1) \wedge (p_2 \wedge q_2) \wedge \dots \wedge (p_n \wedge q_n)$  (first solve for  $n = 2$  and  $n = 3$ , then generalize);.

2. Compute the complement of the CNFs found above.

3. Design an algorithm for bringing a formula into DNF.