Homework 1

1. Prove the distributive law

$$P \vee (Q \wedge R) \sim (P \vee Q) \wedge (P \vee R)$$

   by using the full truth tables of both statements.

2. Prove the new variable law

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

   using other laws of logic. Justify each step.

3. What is the difference between the symbols $\sim$ and $\Leftrightarrow$. Explain it in your own words.

4. Determine those parantheses (if there is any) for each of the following statements, removal of which don't change the meaning:

   (a) $P \wedge (Q \Rightarrow (R \Rightarrow (\neg S)))$.

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

   (c) $((P \wedge (\neg Q)) \Rightarrow P) \Rightarrow R$

5. Find the disjunctive and conjunctive normal forms of the statements:

   (a) $P \Leftrightarrow Q$.

   (b) $(P \Rightarrow Q) \Rightarrow R$.