Propositional Logic Tutorial 3

Equivalences

1. Show the following equivalences:

a) $P \vee Q \equiv (P \rightarrow Q) \rightarrow Q$

b) $P \wedge Q \rightarrow R \equiv (P \rightarrow R) \vee (Q \rightarrow R)$

c) $P \rightarrow (Q \rightarrow R) \equiv (P \rightarrow Q) \rightarrow (P \rightarrow R)$

Semantic Consequence

2. For each of the following arguments:

i. Guess if it is valid.
ii. Formalise it in propositional logic.
iii. Formally investigate its validity using truth tables.

a. If capital punishment deterred capital crimes, then it would be justified. Since it does not deter such crimes, it is not justified.

b. We cannot both conduct a war and solve our domestic problems. Therefore avoiding war is a necessary condition for the solution of our domestic problems.

3. Consider the lung cancer argument at the beginning of the notes:

Lung cancer is more common among male smokers than it is among female smokers. If smoking were the cause of lung cancer, this would not be true. The fact that lung cancer is more common among male smokers means that it is caused by something in the male make-up. If follows that lung cancer is not caused by smoking, but something in the male make-up.

Formalise the argument and show that the conclusion of the argument is semantically entailed by the premises.