# 4CCS1ELA: Tutorial list 4

**1.** Which of the following are true? Explain your answers carefully.

(i) $P,\ P \to Q \ \models\ Q$;

(ii) $P \to Q \ \models\ Q \to P$;

(iii) $P \vee \neg Q \ \models\ P$;

(iv) $P \wedge \neg P \ \models\ Q$.

**2.** Suppose we have the two propositions (with symbols to represent them):

*It is raining (R) or I work in the yard (W).*
*It is not raining ($\neg R$) or I go to the library (L).*

What conclusion can we draw from them?

**3.** Let $\mathcal{A}$, $\mathcal{B}$ be propositional formulas. Demonstrate that if there exists a propositional formula $\mathcal{C}$ such that $\mathcal{A}$ is a logical consequence of $\mathcal{C}$ and $\mathcal{B}$ is a logical consequence of $\neg\,\mathcal{C}$, then the formula $\mathcal{A} \vee \mathcal{B}$ is a tautology.

**4.** Determine which of these arguments are valid. If an argument is valid, indicate the rule of inference being used. If it is not, what logical error occurs?

(i) If $n$ is a real number such that $n > 1$, then $n^2 > 1$.
Suppose, $n^2 > 1$. Then $n > 1$.

(ii) If $n$ is a real number such that $n > 3$, then $n^2 > 9$.
Suppose, $n^2 \leq 9$. Then $n \leq 3$.

(iii) If $n$ is a real number such that $n > 2$, then $n^2 > 4$.
Suppose, $n \leq 2$. Then $n^2 \leq 4$.