

**TMA1201 Tutorial 03-
T1.3 Formal reasoning**

Show that the following arguments are valid by using formal reasoning.
Define your propositions and/or predicates when necessary.

- 1) $[(a \vee b) \wedge (a \rightarrow c) \wedge (b \rightarrow d)] \Rightarrow c \vee d$
- 2)
$$\begin{array}{l} \neg p \vee q \rightarrow r \\ s \vee \neg q \\ \neg t \\ p \rightarrow t \\ \hline \neg p \wedge r \rightarrow \neg s \\ \therefore \neg q \end{array}$$
- 3) If Jill can sing or Jack can play, then I'll buy the DVD. Jill can sing. I'll buy the DVD player. Therefore, I'll buy the DVD and the DVD player.
- 4) Show that $\forall x [P(x) \rightarrow Q(x)] \wedge \exists x P(x) \Rightarrow \exists x Q(x)$
- 5) Show that $\forall x A(x) \wedge \exists x R(x) \Rightarrow \exists x [A(x) \wedge R(x)]$
- 6) Show that $\forall x (P(x) \wedge Q(x)) \equiv \forall x P(x) \wedge \forall x Q(x)$
- 7) All people that exercise frequently are healthy. Kenny eats vegetables and sleep well. If Kenny does not exercise frequently then he cannot sleep well. Therefore some people are healthy.