

FIRST ORDER LOGIC INTO CNF

1) Eliminate biconditionals and implications

$$\alpha \Rightarrow \beta \equiv \neg \alpha \vee \beta$$
$$\alpha \Leftrightarrow \beta \equiv (\alpha \Rightarrow \beta) \wedge (\beta \Rightarrow \alpha)$$

2) Move \neg inwards

$$\neg(\alpha \wedge \beta) \equiv \neg \alpha \vee \neg \beta$$

$$\neg(\alpha \vee \beta) \equiv \neg \alpha \wedge \neg \beta$$

$$\neg \neg \alpha \equiv \alpha$$

$$\neg(\forall x \phi) \equiv \exists x \neg \phi$$

$$\neg(\exists x \phi) \equiv \forall x \neg \phi$$

3) Standardise the variables by renaming them

4) Skolemize: Replace the variable in the existential quantifier by a skolem function or constant

example: $\exists x \text{Rich}(x)$ becomes $\text{Rich}(G1)$
where $G1$ is a skolem constant

5) Drop all universal quantifiers

$\forall x \text{Person}(x)$ becomes $\text{person}(x)$

6) Distribute \wedge over \vee

$(\alpha \wedge \beta) \vee \gamma$ becomes $(\alpha \vee \gamma) \wedge (\beta \vee \gamma)$