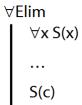
### PH133 Logic Lecture 6

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### Rule of proof: ∀Elim



# **DeMorgan and other equivalences**

$$\neg (A \land B) \Rightarrow \models (\neg A \lor \neg B)$$

$$\neg (A \lor B) \Rightarrow \models (\neg A \land \neg B)$$

$$A \rightarrow B = \neg A \lor B$$

 $\neg(A \rightarrow B) = \neg(\neg A \lor B) = A \land \neg B$ 

# Scope

In P  $\land$  (QVR), the scope of  $\land$  is P $\land$  (QVR) In P  $\land$  (QVR), the scope of V is (QVR)

In  $(P \wedge Q) \vee R$ , the scope of  $\wedge$  is  $(P \wedge Q)$ 

In  $(P \land Q) \lor R$ , the scope of  $\lor$  is  $(P \land Q) \lor R$ 

The scope of a connective is the smallest constituent expression which contains that connective.

# Subproofs are tricky

Step 7 of this proof is wrong. Why?

T 1. R 
$$\vee$$
 S  $\frac{R S R \vee S R \wedge S}{T F T}$  F

2. R
3. S  $\vee$  R  $\vee$  Intro: 2

4. S
5. S  $\vee$  R  $\vee$  Intro: 4

6. S  $\vee$  R  $\vee$  Elim: 1,2-3,4-5

F 7. R  $\wedge$  S  $\wedge$  Intro: 2.4

# Which step of this proof is wrong? Why?

### What not to confuse

 $\neg (P \rightarrow Q) \text{ vs. } P \rightarrow \neg Q$ 

 $\exists x \ ( \text{Square}(x) \land \text{Blue}(x) ) \text{ vs.}$   $\exists x \text{Square}(x) \land \exists x \text{ Blue}(x)$   $\neg (P \lor Q) \text{ vs. } \neg P \lor \neg Q$  $\neg (P \land Q) \text{ vs. } \neg P \land \neg Q$ 

# Proof example with $\rightarrow$

6. ¬Р

#### ¬Intro proof example

