

# Quantifiers and identity

## 1. Quantifier rules

$$\frac{c \mid A^c/x}{\forall x A} \quad \forall I$$

$$\frac{\forall x A}{A^c/x} \quad \forall E$$

$$\frac{A^c/x}{\exists x A} \quad \exists I$$

$$\frac{c \mid A^c/x \quad B}{B} \quad \exists E \quad (c \notin B)$$

An easier  $\exists E$ :

$$\frac{\exists x A \quad c \mid A^c/x}{\quad}$$

( c new  
c doesn't occur outside  
its scope line or  
in conclusion )

## 2 Identity rules

$$\frac{}{a=a} = \text{I} \quad \frac{A \quad a=b}{A^a//b} = \text{E}, \quad \frac{A \quad b=a}{A^a//b} = \text{E}$$

## 3 Notation:

\*  $A^c/x$  is the result of replacing each free occurrence of  $x$  with  $c$

\*  $A^a//b$  is the result of replacing some number of occurrences of  $b$  with  $a$