PREDICATE CALCULUS: RULES

GENERAL AND PARTICULAR

General:
- Universal quantifier ∀x
- Variables designated by "y", that refer to things in general

Particular:
- Existential quantifier ∃x
- Constants designated by "a" that refer to a particular thing

QUANTIFICATION RULES

∀E (UI): Universal Elimination/Instantiation. Two forms (variables and constants).
- Variable: ∀x(Fx) / ⊦ Fy
- Constant: ∀x(Fx) / ⊦ Fa

∀I (UG): Universal Introduction/Generalization. One form (only variables, not constants):
- Variable: Fy / ⊦ ∀x(Fx)
- Constant: impermissible (e.g., ~~Fa / ⊦ ∀x(Fx)~~)

∃I (EG): Existential Introduction/Generalization. Two forms (variables and constants).
- Variable: Fa / ⊦ ∃x(Fx)
- Constant: Fy / ⊦ ∃x(Fx)

∃E (EI): Existential Elimination/Instantiation. One form (only constants, not variables). Also, existential name “a” must be a new name that has not occurred in any previous line.
- Variable: impermissible (e.g., ~~∃x(Fx) / ⊦ Fy~~)
- Constant: ∃x(Fx) / ⊦ Fa

OTHER RULES

Quantifier Equivalence Rules (Quantifier Exchange QE)
- ∀x(Fx) :: ~∃x~(Fx)
- ~∀x(Fx) :: ∃x~(Fx)
- ∀x~(Fx) :: ~∃x(Fx)
- ~∀x~(Fx) :: ∃x(Fx)

Identity (ID)
- Fx, x=y / ⊦ Fy