

Domain of quantification: {x: x is a character in *Star Wars*}

Names: b Ben
 l Luke
 v Vader

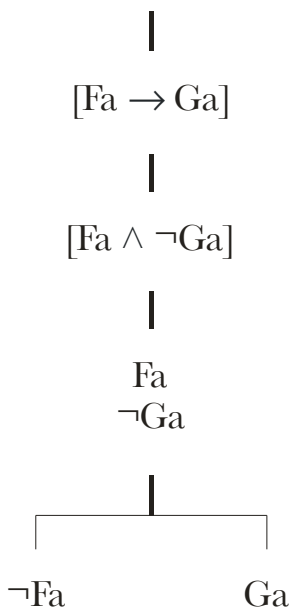
Predicates: Hx x is heroic
 Jx x is a Jedi
 Wx x is a Wookie
 Fxy x is stronger in the Force than y

1. Taking the above interpretation, formalize the following as predicate formulae:

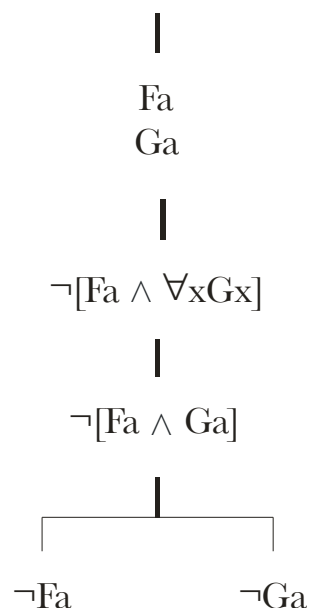
- i. If no Wookies are heroic, then no Wookies are heroic Jedi.
- ii. Vader is stronger in the Force than any Wookie.
- iii. Only Luke and Ben are stronger in the Force than Vader.
- iv. If no Jedi is heroic, then Vader is stronger in the Force than anyone else.
- v. Any Wookie who is stronger in the Force than Ben is a heroic Jedi.
- vi. No two Jedi are both stronger in the Force than Vader.
- vii. No two Jedi are both stronger in the Force than each other.
- viii. Only Luke is only stronger in the Force than a Wookie.
- ix. If any Wookie is stronger in the Force than some Jedi, then that Wookie is heroic.
- x. Yoda is not a heroic Wookie.

2. The tableaux below were all produced by P. J. Cretin-Mangler of Christ Church; as usual, **each** tableau contains **two** errors. Identify each error and explain what P. J. has done wrong:

i. $\forall x [Fx \rightarrow Gx]$
 $\exists x [Fx \wedge \neg Gx]$



ii. $[Fa \wedge Ga]$
 $\neg [\forall x Fx \wedge \forall x Gx]$



$$\text{iii. } \neg \forall x \forall y [R_{xy} \rightarrow R_{xy}]$$

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$$\exists x \neg \forall y [R_{xy} \rightarrow R_{xy}]$$

|

$$\exists x \exists y \neg [R_{xy} \rightarrow R_{xy}]$$

|

$$\neg [R_{ab} \rightarrow R_{ab}]$$

|

$$R_{ab}$$

$$\neg R_{ab}$$



Finally, an RTQ teaser: one of P. J.'s tableaux should not have closed – which one was it?

3. Use predicate tableaux to show that the following syntactic sequents are correct:¹

i. $\exists x [F_x \wedge \neg F_x] \vdash$

ii. $\forall x F_x \vdash \forall y F_y$

iii. $F_a, G_b \vdash \exists x \exists y [F_x \wedge G_y]$

iv. $\forall x [F_x \rightarrow G_x], \forall x F_x \vdash \forall x G_x$

v. $\forall x [F_x \rightarrow G_x], \forall x [G_x \rightarrow H_x] \vdash \forall x [F_x \rightarrow H_x]$

vi. $\exists x F_x, \forall x [F_x \rightarrow G_x] \vdash \exists x G_x$

vii. $\forall x \forall y R_{xy} \vdash \forall y \forall x R_{yx}$

viii. $\exists x \forall y R_{xy} \vdash \forall x \exists y R_{yx}$

ix. $\forall x R_{xx}, F_a \vdash \neg \forall x \forall y [R_{xy} \rightarrow \neg R_{yx}]$

x. $\vdash \forall x \exists y x=y$

4. Do exercises 40.1 (a), (b) and (d) from the Logic Exercises booklet. If you have the time, energy and inclination, finish off in style by tackling exercise 40.E (on the page before 40.1).

If you don't have the booklet, please buy, beg, borrow or steal a copy. There's one in the library; Peter has one; 2nd-years should have them; and the Faculty sell them for a song.

¹ It would be helpful if you could work out the more complicated ones on scrap paper before writing them out.