

- xvii $U:\{a\}$ $F:\{a\}$ $G:\{\}$ $H:\{a\}$
 $Fa \ \& \ Ga \rightarrow Ha, Fa \ \& \ Ha \vdash Ga$
- xviii $U:\{a,b\}$ $F:\{a\}$ $G:\{a\}$ $H:\{b\}$
 $Fa \ \vee \ Fb, Ga \ \vee \ Gb, Ha \ \vee \ Hb \vdash (Fa \ \vee \ Ga \rightarrow Ha) \ \& \ (Fb \ \vee \ Gb \rightarrow Hb)$
- xix $U:\{a,b\}$ $F:\{a\}$
 $\sim(Fa \ \& \ Fb) \vdash \sim Fa \ \& \ \sim Fb$
- xx Same model as i
 $(Fa \rightarrow Ga \ \vee \ Gb) \ \vee \ (Fb \rightarrow Ga \ \vee \ Gb) \vdash Fa \ \vee \ Fb \rightarrow Ga \ \vee \ Gb$

Exercise 4.3.1

- i $U:\{a,b\}$ $F:\{\langle a,a \rangle\}$
 $Faa \ \vee \ Fbb \vdash Faa \ \& \ Fba \ \& \ Fab \ \& \ Fbb$
- ii $U:\{a,b\}$ $F:\{\langle a,b \rangle, \langle b,a \rangle\}$
 $(Faa \ \vee \ Fba) \ \& \ (Fab \ \vee \ Fbb) \vdash Faa \ \vee \ Fbb$
- iii Same model as ii
 $(Faa \ \vee \ Fab) \ \& \ (Fba \ \vee \ Fbb) \vdash (Faa \ \& \ Fba) \ \vee \ (Fab \ \& \ Fbb)$
- iv $U:\{a\}$ $F:\{\}$ $G:\{\langle a,a \rangle\}$
 $\sim Faa, Gaa \rightarrow \sim Faa \vdash \sim Gaa$
- v Same model as iv
 $Fa \rightarrow Gaa \vdash Fa \ \vee \ \sim Gaa$
- vi $U:\{a,b\}$
 $V:\{\langle a,a,a \rangle, \langle b,b,b \rangle, \langle a,a,b \rangle, \langle b,b,a \rangle\}$
 $((Vaaa \ \& \ Vaab) \ \vee \ (Vaba \ \& \ Vabb)) \ \& \ ((Vbaa \ \& \ Vbab) \ \vee \ (Vbba \ \& \ Vbbb))$
 $\vdash ((Vaaa \ \& \ Vaab) \ \& \ (Vbaa \ \& \ Vbab)) \ \vee \ ((Vaba \ \& \ Vabb) \ \& \ (Vbba \ \& \ Vbbb))$