Elements of Deductive Logic

Exercise set #6: Predicate logic

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1 Truth in a model

Given the following model, with names a, b, c:

$D = \{d, e, f\}$

I	
a	d
b	e
c	f

$I(F)$	
d	0
e	1
f	1

$I(G)$	
d	1
e	1
f	0

$I(T)$	d	e	f
d	0	1	0
e	1	0	1
f	0	1	0

evaluate the following wff's:

1. $(\forall x)(Fx \supset Gx)$
2. $(\forall x)(\forall y)(Txy \supset Tyx)$
3. $(\forall x)(\forall y)(Txy \supset (Tyx\& \sim Fx))$
4. $(\exists x)(\forall y)((Txy\&Fy) \supset (Gx\&Txy))$
5. $(\forall x)(\forall y)((\exists z)(Txz\&Txy) \supset (\exists z)(Tyz\&Tzx))$

2 Tableaux

Use the tableaux method to check for validity providing countermodels if necessary:

1. $(\forall x)Fx \vdash Fa$

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2. $Fa, Ga \vdash (\exists x)(Fx \& Gx)$
3. $(\exists x) \sim Fx \vdash \sim (\forall x)Fx$
4. $(\exists x)Fx, (\forall x)(Fx \supset Gx) \vdash (\exists x)Gx$
5. $(\forall x)Fx, (\forall x)Gx \vdash (\forall x)(Fx \& Gx)$
6. $(\exists x)(Fx \vee Gx) \vdash (\exists x)Fx \vee (\exists x)Gx$
7. $\vdash (\forall x)(Fx \supset Ga) \equiv ((\exists x)Fx \supset Ga)$
8. $(\exists x)(\forall y)Rxy \vdash (\forall x)(\exists y)Ryx$
9. $(\exists x)(\forall y)(Rxy \equiv \sim Ryy) \vdash$
10. $(\forall x)(Px \supset Sx), (\exists x)(Px \& Sx) \supset Cm \vdash Cm$