

Extra Quantifier Questions

Joshua Norton

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1 Exercise (Hard)

$$(1) (x)[\sim Hx \vee (\exists y)[(\sim Py \supset \sim Tx) \vee \sim Tx]]$$

$$(2) [(z)(Hz \cdot \sim Tz)] \supset (y)Wy$$

$$(3) [(\exists y) \sim (Wy \equiv Hy)] \supset [(z)(Pz \supset \sim Iz)]$$

$$(4) \therefore [\sim (z)Wz] \supset [(y)Hy \supset [(\exists z) \sim Iz]]$$

2 Exercise (Medium, turns out to have a simple solution)

$$(1) (x)(\sim Tx \equiv \sim Gx)$$

$$(2) [(y)Cy] \vee [(\exists y)Gy]$$

$$(3) \sim Dc \supset Gc$$

$$(4) \sim [(\exists x)Dx \cdot (z)Bz]$$

$$(5) [(\exists z)Cz] \supset [(w)Bw]$$

$$\therefore [(\exists y)Ty] \equiv [(\exists x)Gx]$$

3 Exercise (Medium)

$$(1) (x)(Tx \equiv \sim Rx)$$

$$(2) [\sim (y)Iy] \supset [(\exists x)Px]$$

$$(3) (w)(Tw \vee \sim (Ow \cdot Iw))$$

$$\therefore [(\exists y)Py] \equiv [((y) \sim Py) \supset (\exists y)(Ry \cdot Oy)]$$

4 Exercise (Medium)

$$(1) (z)(\exists y)(Byz \vee Cz)$$

$$(2) A \supset (\exists y)Ty$$

$$(3) (x) \sim (\sim Bax \cdot Cx)$$

$$\therefore [(x) \sim Tx] \supset \sim [(x) \sim Bxb] \vee A]$$

5 Exercise (Med/Hard)

$$(1) (x)[Bfx \equiv Gfx]$$

$$(2) (\sim a = f) \vee (\exists x)((\sim x = a) \cdot (\sim x = f))$$

$$(3) (x)[Hx \supset x = a]$$

$$(4) (z)[(\sim z = a) \supset ((z = f) \vee Bfz)]$$

$$\therefore Hf \supset ((\exists x)[Bfx \cdot \sim x = a] \cdot (\exists y)Gya)$$

6 Exercise (Harder-solution available)

$$(1) (x)(\exists y)[(Axy \supset y = x) \cdot Fy]$$

$$(2) (\exists z)(y)[z = a \cdot \sim z = y] \equiv (\exists x)[(\exists z) \sim Axz \cdot Hx]$$

$$(3) (\exists x)[Bxb \supset (x = a \cdot Hx)]$$

$$(4) (x)[(Axx \cdot Fx) \supset \sim (Hx \cdot x = a)]$$

$$\therefore (\exists y)(\exists x) \sim Bxy$$