

**Assignment #9. Due Thurs April 7.**

1. Consider the  $q$ -valuation  $q$  defined by:
- (i) Domain = {Romeo, Juliet, Benedick, Beatrice}
  - (ii)  $m \Rightarrow \text{Romeo}$   
 $n \Rightarrow \text{Juliet}$
  - (iii)  $F \Rightarrow \{\text{Romeo, Benedick}\}$   
 $G \Rightarrow \{\text{Juliet, Beatrice}\}$   
 $L \Rightarrow \{\langle \text{Romeo, Juliet} \rangle, \langle \text{Juliet, Romeo} \rangle, \langle \text{Benedick, Beatrice} \rangle, \langle \text{Beatrice, Benedick} \rangle, \langle \text{Benedick, Benedick} \rangle\}$

Determine the truth values of the following  $wffs$  with respect to  $q$ :

- (a)  $\exists x Lmx$
  - (b)  $(\exists x Lmx \supset Lmn)$
  - (c)  $\forall x (Gx \supset \exists y Lxy)$
  - (d)  $\exists x (Fx \wedge \forall y (Gy \supset Lxy))$
2. Determine if the following arguments in **QL** are  $q$ -valid by constructing appropriate **QL** "truth trees". (This means each step involves the assignment of T to a  $wff$ ; and each step must be justified by a **QL semantic** rule Q1-Q7, or a semantic result V1-V5, and *not* a **QL** formal tree rule.) For non- $q$ -valid arguments, construct an explicit countermodel.
- (a)  $\forall x (Fx \supset Gx) \therefore \forall x (Gx \supset Fx)$
  - (b)  $\forall x (Fx \supset Gx) \therefore \forall x (\neg Gx \supset \neg Fx)$
3. Show that the  $wff \forall x ((Fx \wedge Gx) \supset (Fx \vee Gx))$  is a  $q$ -logical truth by constructing an appropriate **QL** "truth tree". (This means each step involves the assignment of T to a  $wff$ ; and each step must be justified by a **QL semantic** rule Q1-Q7, or a semantic result V1-V5, and *not* a **QL** formal tree rule.)