Assignment #8. Due Thurs March 31.

1. Indicate whether the **QL** *wffs* below are true or false under the following translation key.
   Domain of discourse = {1, 2, 3, ... } (the set of positive integers)
   F means ____is even
   L means ____is less than____
   m means 1

   (a) ¬Lmm
   (b) ∃x(Fm ⊃ Fx)
   (c) ∀y∃xLxy
   (d) ∃y∀xLxy

2. Construct proofs for the following claims:
   (a) If a *q*-valuation makes ¬∃*vC*(...*v*...*v*...) true, then it also makes ∀*v*¬*C*(...*v*...*v*...) true.

   (b) Suppose *q* is a *q*-valuation and *A* and *B* are **QL** *wffs*. Then ¬(*A* ∧ *B*) $\Rightarrow_q$ T if and only if (¬*A* ∨ ¬*B*) $\Rightarrow_q$ T.

   (c) Suppose *A* is a **QL** *wff* that does not contain the variable *v*. If a *q*-valuation makes (*A* ⊃ ∀*vC*(...*v*...*v*...)) false, then it also makes ∀*v*(*A* ⊃ *C*(...*v*...*v*...)) false.

   (***Hints***: Assume there's a *q*-valuation *q* such that (*A* ⊃ ∀*vC*(...*v*...*v*...)) $\Rightarrow_q$ F. What does this mean? Look at Semantic Rule (Q4). You'll then need to know what ∀*vC*(...*v*...*v*...) $\Rightarrow_q$ F means. See Rule (Q5). Note, also, that if *A* $\Rightarrow_q$ T, then *A* $\Rightarrow_{q+}$ T, for any *v*-variant q^+ of *q*. You should be able to explain why. Finally, remind yourself what you need to eventually demonstrate; namely, ∀*v*(*A* ⊃ *C*(...*v*...*v*...)) $\Rightarrow_q$ F. What does this mean? See Rule Q5 again.)

Extra Credit #2. Due Thurs March 31.

1. Indicate whether the **QL** *wffs* below are true or false under the following translation key.
   Domain of discourse = {1, 2, 3, ... } (the set of positive integers)
   F means ____is even   L means ____is less than____   m means 1

   (a) ∀x(Fx ⊃ ∃yLyx)
   (b) ∀x(∃yLyx ⊃ Fx)
   (c) ∃x(∃yLyx ⊃ Fx)
   (d) ∃x∀y(Lmy ⊃ Lxy)
   (e) ∀x∀y(Lxy ⊃ ∃z(Lxz ∧ Lzy))