3. By using only basic rules of QL and SL, prove the following:

a. ∃x¬Px ∴ ¬∀xPx

b. ∅ ∴ ∀x¬Px → ¬∃xPx

c. ∃x (Px & ∀y (Py → y=x)) ∴ ∀x∀y ((Px & Py) → x=y)

d. ∃x (Fx & ∀y (Fy → x=y)) ∴ ∃xFx & ∀x∀y((Fx & Fy) → y=x)

1. Translate the English sentences “Everyone likes someone” and “There’s someone who

everyone likes” into QL. Use ‘Lxy’ to abbreviate ‘x likes y’. If any of these sentences is

provable from the other in QL, provide a proof to show that this is the case. If neither is

provable from the other, explain why this is the case.

2. Consider the next sentence and answer the questions below:

(1) {∀x(Px → ∃y(Qy∧Rxy)), ∃zQz} ⊨ ∃y(Qy∧∀x(Px → Rxy))

a) Is there a model showing that (1) is false, in which Q has an empty extension? If there

is such a model, construct it. If there isn’t one, explain why.

b) Is there a model showing that (1) is false, in which P has an empty extension? If there

is such a model, construct it. If there isn’t one, explain why.

c) Is there a model showing that (1) is false with a UD containing only one object? If there

is such a model, construct it. If there isn’t one, explain why.

d) Provide a model in which (1) is false, with a UD containing only two objects.