Assignment 7 (due Tuesday, April 16 in class)

I. Translating quantified arguments into First-Order Predicate Logic

Using the quantifier symbols ∀ and ∃ where appropriate, provide First-Order Predicate Logic translations for the following English sentences. Remember to provide a key for any predicate constants and individual constants that appear in your translations.

(1) A young woman arrived.
(2) Ida saw something sinister.
(3) All roads lead to Rome.
(4) London welcomes all travellers from Spain.
(5) There is a castle in Edinburgh.
(6) Someone murdered Clive.
(7) Clive got murdered.
(8) The boat got sunk.
(9) The boat sank.
(10) Nobody saw Charles.
(11) Gina or Boris fed every puppy.

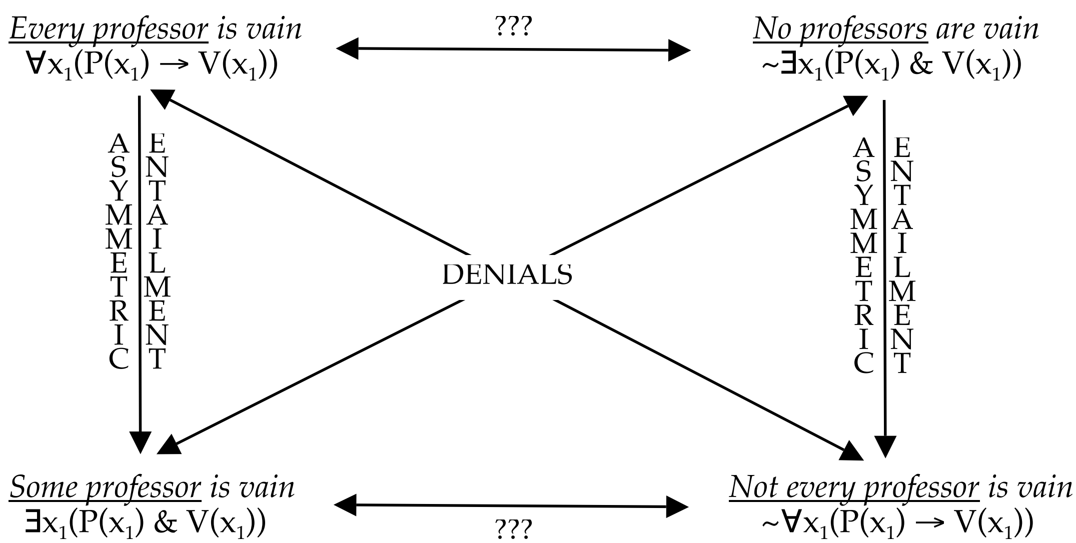
(Note that (11) is semantically ambiguous.)

II. Quantified arguments and negation

Complete the "Negation" exercises (5) and (6) on pg. 56 of your Kearns textbook.

III. The Aristotelian Square of Opposition (2 pages)

As we saw in class, the Aristotelian Square of Opposition is a traditional means of representing the semantic relationships amongst sentences containing *every*, *no*, *some*, and *not every* (as well as related words, such as *all*, *each*, *a*(*n*), etc.).



Here, you will investigate the relationships between *every* and *no*, and between *some* and *not every*. The following model M_1 and assignment function g will be relevant for your investigations:

M_1: D = { Carol, Paul, Pete, Jon, Nick }

Val(PROFESSOR) = { Carol, Paul, Pete, Jon }

Val(VAIN) = { Paul, Pete, Nick }

$$g: \begin{pmatrix} x_1 \mapsto \text{Paul} \\ x_2 \mapsto \text{Carol} \\ x_3 \mapsto \text{Pete} \\ \ldots \end{pmatrix}$$

A. Relative to the model M_1 and the assignment function g, is the formula $\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$ true or false? What about the formula $\sim\exists x_1(\text{PROFESSOR}(x_1) \;\&\; \text{VAIN}(x_1))$? For each formula, briefly describe the relevant features of the model that justify your conclusion.

III. The Aristotelian Square of Opposition (continued)

B. Is it possible to construct a different model (call it M_2), so that the formulas $\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$ and $\sim\exists x_1(\text{PROFESSOR}(x_1)\ \&\ \text{VAIN}(x_1))$ are **both true** relative to the new model M_2 and g? If it is, then provide one. If not, then provide a brief explanation of what goes wrong when attempting to construct such a model. (**Note:** only consider models in which *Val*(PROFESSOR) has **at least one** member.)

C. Based on your conclusions from Parts A and B, determine whether $\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$ and $\sim\exists x_1(\text{PROFESSOR}(x_1)\ \&\ \text{VAIN}(x_1))$ are logically compatible or logically incompatible.

D. Relative to the original model M_1 and assignment function *g*, is the formula $\exists x_1(\text{PROFESSOR}(x_1)\ \&\ \text{VAIN}(x_1))$ true or false? What about the formula $\sim\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$? For each formula, briefly describe the relevant features of the model that justify your conclusion.

E. Is it possible to construct a different model (call it M_3) so that the formulas $\exists x_1(\text{PROFESSOR}(x_1)\ \&\ \text{VAIN}(x_1))$ and $\sim\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$ are **both false** relative to the new model M_3 and g? If it is, then provide one. If not, then provide a brief explanation of what goes wrong when attempting to construct such a model. (**Note:** only consider models in which *Val*(PROFESSOR) has **at least one** member.)

F. Based on your conclusions from Parts D and E, determine whether $\exists x_1(\text{PROFESSOR}(x_1)\ \&\ \text{VAIN}(x_1))$ and $\sim\forall x_1(\text{PROFESSOR}(x_1) \rightarrow \text{VAIN}(x_1))$ are logically compatible or logically incompatible.