1. Formalising Natural-Language Sentences

Try to represent the following sentences as appropriate formulas of first-order logic (please ignore tense). Definite descriptions (e.g., “the sea”) can be treated like proper names as constants.

1. It is raining.
2. John doesn’t love Mary.
3. Nobody is loved by no one.
4. All students are intelligent.
5. Every intelligent student is successful.
6. If all students are successful, then Mary is successful, too.
7. If Pedro owns a donkey, he beats it.
8. Everybody is annoyed if somebody is noisy.
9. Dolphins are mammals that live in the sea.

2. Lexical Semantics

The content words in the “Dolphin Document” on slide 31 have been highlighted red. The WordNet 2.0 Web Interface (http://wordnet.princeton.edu/perl/webwn) allows to search for the complete hypernym chain of an expression. Look up all marked common nouns in the Web Interface, select that sense which is relevant in the context of the document, look up the hypernym chain, and construct the (possibly not fully connected) graph that contains all marked common nouns.

Note: You need not take over every node from the WordNet hypernym chain, but only those ones that you consider to be the more important ones. All branching nodes should be taken into account, however.

3. Semantics Construction

The sentence (10) can be represented in type theory as (11):

(10) No student works.

(11) $\neg\exists x\ (\text{student}(x) \wedge \text{work}(x))$

Try to give a lambda term for “no” (cf. “every” on slide 68) and compute a semantic representation for sentence (10).