



7.1 Translate each of the following statements into a *First Order Logic sentence*, using a consistent vocabulary (which you must define).

- i. Not all students take both History and Biology.
- ii. There is a barber in town who shaves all men who do not shave themselves.
- iii. Politicians can fool all of the people some of the time, they can even fool some of the people all of the time, but they can't fool all of the people all of the time.

7.2 Consider the following two First Order Logic sentences:

$$(i) \quad \forall x (\text{Boy}(x) \Rightarrow \exists y (\text{Girl}(y) \wedge \text{Likes}(x, y)))$$

$$(ii) \quad \exists y (\text{Girl}(y) \wedge \forall x (\text{Boy}(x) \Rightarrow \text{Likes}(x, y)))$$

- (a) Give a concise interpretation of each sentence in plain English.
- (b) Explain informally whether the two sentences are equivalent or, if not, whether (i) logically entails (ii), or whether (ii) logically entails (i), or else if they are unrelated.
- (c) Describe how the results ascertained in part (b) could be proven formally using logical reasoning. (A detailed proof is not required.)