Predicate Logic

Ex. 6.
The following sentences are ambiguous. Explain the source of the ambiguity, and propose, *when it's possible*, the two distinct representations that can be associated with those two sentences.

(5) a. Every student is reading an article.
b. Sam likes wild cats and dogs.
c. All the participants did not enjoy the meal.
d. Paul should be in São Paulo.

Ex. 7.
Translate the following sentences into predicate logic (providing in each case the interpretation of non logical constants —e.g. $L(x, y) = x$ loves y). In case of ambiguity, give as many formulae as necessary.

(6) a. John is taller than Marie.
b. Paul saw Lea and she did not see him.
c. If John is a man, then he is mortal.
d. A cat came in.
e. Some children are not ill.
f. All elephants have a trunk.
g. All men do not like Marie.
h. There is a song that no child sings.
i. If every man loves Marie, then she is happy.
j. All the farmers appreciate a member of parliament.

Ex. 8.
The following sentences are characterized by the fact that the indefinite, under the scope of a universal quantification, is interpreted as universal. This situation is not surprising when one remembers the equivalence between $\forall x(\varphi \rightarrow \psi)$ and $(\exists x\varphi \rightarrow \psi)$ (if ψ does not contain free occurrences of x). On the basis of this equivalence, propose for each of the following sentence two translations in fol.

(7) a. Paul gets upset as soon as someone is noisy.
b. Everybody gets upset if someone is noisy.
c. All the tourists who visit Paris are rich.
d. All the tourists who visit Paris love it.
e. All the tourists who visit a city are rich.
f. All the tourists who visit a city love it. .
g. If a farmer owns a donkey, he beats it.
h. Everyone is marked by an unrequited love.

Ex. 9.
Show that the formulae of each following pair are not logically equivalent, by providing an example of a situation where one of the formulae is true and the other one false.

(8) a. $\forall x(A \vee B)$ *vs.* $(\forall xA \vee \forall xB)$
b. $\exists x(A \wedge B)$ *vs.* $(\exists xA \wedge \exists xB)$