Assignment 2
Ling 106
Due February 4, 2002 in class

1. Define a logical connective that corresponds to English
"neither...nor" (e.g., "neither p nor q"). [Hint: First invent a symbol
to denote it.]

2. Express the statement \( P \leftrightarrow Q \) using conjunction and negation only.
[See page 15 of Sipser. You will notice there is a typo on that page:
\( P \leftrightarrow Q \) is equivalent to \((P \rightarrow Q) \land (Q \rightarrow P)\).]

3. Does conjunction distribute over implication? That is, is \( p \land (q \rightarrow r) \)
equivalent to \((p \land q) \rightarrow (p \land r)\)? Provide truth tables to support your
answer.

4. (a) Translate the following argument into propositional logic (assume
that "a unless b" translates as \( \neg a \rightarrow b \)):

If you clean your house, you will not mow your lawn. But
you will be unhappy unless you clean your house.
Therefore, if you mow your lawn, you will be unhappy.

[Hint: You will need to define some atomic statements, for example:
Let \( p = "You clean your house." \)
Let \( q = "You (will) mow your lawn." \)
Let \( r = "You will be unhappy." \)]

(b) Is the argument valid? That is, does the conclusion follow from
the premises? Why or why not?