1. We said that functions and forms (or special forms) have to be handled differently by the Lisp interpreter.
   a. Why was this? Explain precisely.
   b. How is this difference reflected in the Lisp interpreter? Explain precisely.

2. We said, in our discussion of the Lisp interpreter, that eval[] calls apply[] to handle the case of function application. But apply[], we said, then turns around and calls eval[] to evaluate the function. How can this work? Who actually applies the function? Explain precisely.

3. Consider the following results:
   a. \{true\} x := 0 \{false\}
   b. \{false\} x := 0 \{true\}
   c. \{false\} x := 0 \{false\}
   d. \{true\} x := 0 \{true\}

   For each one, state whether it is valid or not, along with a brief explanation. For each one, state whether it is derivable or not using the axioms and rules we have seen, and if it derivable briefly indicate how you would derive it.

4. Suppose the behavior of the ‘read x;’ command is changed as follows: in addition to reading in the first value in the IN sequence into the variable x and removing that value from the IN sequence, it now also writes out the value to the OUT sequence; in other words, the read command ‘echoes’, to the output stream, whatever it reads.

   Will the existing partial correctness axiom for read be consistent with respect to this model? Complete (or, more precisely, relatively complete)? Explain.

5. Consider again the read statement as modified in the previous question. Propose a new partial correctness rule for the read command corresponding to this modified behavior. Provide an informal justification for your rule.
6. Consider the following:

\[
\begin{align*}
\{ \ #\text{OUT} = 0 \ # \} \\
\text{read } x; \text{ read } y; \\
\text{write } (x+y); \ z := x+y; \\
\{ \ \text{OUT}[1] = z \}
\end{align*}
\]

Derive the above result using the axioms and rules we have seen. If it cannot be derived, explain what the problem is.

7. Consider the following rule for sequential composition:

\[
\frac{\{ p \} S_1 \{ q' \}, \ q \Rightarrow q', \ \{ q \} S_2 \{ r \}}{\{ p \} S_1 ; S_2 \ { r }}
\]

If we replaced our current sequential composition rule with this rule, would our axiom system be consistent (with the standard operational model)? Would the axiom system be complete (with respect to the standard operational model)? Justify your answers.