Software Verification  
Exercise Session 5

1. Hoare logic

Write a program which computes the factorial of an integer x and stores the result in variable y. You may use helper variable(s) if needed. Prove the correctness of your algorithm.

2. Separation logic

In the lecture you have seen how separation logic can be used to prove

\{tree _ p\} disptree(p) \{empty\}

Now prove

\{tree \_ i\} copytree(i; j) \{tree \_ i * tree \_ j\}

where

\begin{verbatim}
copytree(i; j) =
  if i = nil then
      j := i
  else
      newvar i1, i2, v, j1, j2 in
      i1 := [i];
      v := [i + 1];
      i2 := [i + 2];
      copytree(i1, j1);
      copytree(i2, j2);
      j := cons(j1, v, j2);
  end
end
\end{verbatim}

Only a proof outline similar to the one in the lecture (i.e. assertion-annotated code) is required, since a detailed proof would be very large.