1[6] Let $x$ and $y$ be integer variables. Find the exact precondition for $x' = y$ to be refined by $y := 1$.

2[9] Let $x$ and $y$ be integer variables. Prove $x + y = 5$ is an invariant for $x := x + 1$. $y := y - 1$.

3[18] The notation \texttt{do P while b od} has been used as a loop construct that is executed as follows. First, $P$ is executed; then $b$ is evaluated, and if its value is $\top$ then execution is repeated, and if its value is $\bot$ then execution is finished. Let $m$ and $n$ be integer variables. Prove $m := m + n - 10$. $n := 10$ $\Leftarrow$ \texttt{do m := m - 1. n := n + 1 while n $\neq$ 10 od}$

4[9] Let $L$ be a list-of-integers variable, $L: [*int]$. Here is a for-loop that changes all the negative items of $L$ to 0, and otherwise leaves $L$ unchanged.

\texttt{for i := 0;..#L do if L i < 0 then L := i $\rightarrow$ 0 | L else ok fi od}

State formally what must be proven in order to prove that this program is correct. You do not need to prove it; you just need to say what must be proven.