5.5 Program Correctness

5.5 pg. 377 # 1

Prove that the program segment
\[
\begin{align*}
y &:= 1 \\
z &:= x + y
\end{align*}
\]
is correct with respect to the initial assertion \( x = 0 \) and the final assertion \( z = 1 \).

5.5 pg. 377 # 3

Verify that the program segment
\[
\begin{align*}
x &:= 2 \\
z &:= x + y \\
\text{if } y > 0 \text{ then } \\
\quad z &:= z + 1 \\
\text{else } \\
\quad z &:= 0
\end{align*}
\]
is correct with respect to the initial assertion \( y = 3 \) and the final assertion \( z = 6 \).

5.5 pg. 377 # 7

Use a loop invariant to prove that the following program segment for computing the \( n \)th power, \( n \) is a positive integer, of a real number \( x \) is correct.
\[
\begin{align*}
power &:= 1 \\
i &:= 1 \\
\text{while } i \leq n \\
\quad power &:= power \cdot x \\
\quad i &:= i + 1
\end{align*}
\]

5.5 pg. 377 # 11

Suppose that both the program assertion \( p\{S\}q_0 \) and the conditional statement \( q_0 \rightarrow q_1 \) are true. Show that \( p\{S\}q_1 \) also must be true.