Homework II

1. [20 points]
Provide the (partial) correctness proof of the program fragment below using the proof rules in chapter 14 of Diller.

\[
\begin{align*}
\{ \text{INCH} \geq 0 \} \\
\text{FOOT} &:= \text{INCH} \times 12; \\
\text{YARD} &:= \text{FOOT} \times 3; \\
\text{MILE} &:= \text{YARD} \times 1760 \\
\{ \text{INCH} \geq 0 \} \land \text{FOOT} = \text{INCH} \times 12 \land \text{YARD} = \text{INCH} \times 36 \land \text{MILE} = \text{INCH} \times 63360
\end{align*}
\]

2. [20 points]
Provide the (partial) correctness proof of the program fragment below for absolute value using the proof rules in chapter 14 of Diller.

\[
\begin{align*}
\{ \text{true} \} \\
\text{B} &:= \text{A}; \\
\text{if } \text{A} < 0 \text{ then } \text{B} &:= -\text{B} \text{ else } \text{skip} \\
\{ \text{A} \geq 0 \land \text{B} = \text{A} \} \land \{ \text{A} < 0 \land \text{B} = -\text{A} \}
\end{align*}
\]

3. [30 points]
Write a program fragment in Diller's language to compute the minimum \( M \) of the four Integer variables \( A, B, C, \) and \( D \), and prove its partial correctness using the proof rules in chapter 14. The pre-condition is \textbf{true}, and the post-condition is

\[
\begin{align*}
\{ M = \text{A} \land M = \text{B} \land M = \text{C} \land M = \text{D} \} \land \text{M} \leq \text{A} \land \text{M} \leq \text{B} \land \text{M} \leq \text{C} \land \text{M} \leq \text{D}
\end{align*}
\]

Of course, your program should not change \( A, B, C, \) or \( D \).