Example program proof — conditional rule
In this example, we prove a program assertion establishing partial correctness of
a program fragment computing the absolute value of a number.

\{
  \text{true}
\}

\begin{align*}
\text{if } X < 0 & \text{ then } A := -X \text{ else } A := X \\
\{ & (X < 0 \implies A = -X) \quad (X \geq 0 \implies A = X) \}
\end{align*}

1. \[\begin{align*}
\text{by the assignment axiom.}
\end{align*}\]

2. The pre-condition in step 1 is logically equivalent to \( X \leq 0 \), and

\[\begin{align*}
\text{by strengthening the pre-condition of step 1}
\end{align*}\]

3. \[\begin{align*}
\text{by the assignment axiom, and this pre-condition is logically equivalent to } X \geq 0.
\end{align*}\]

4. Using steps 2 and 3 with the conditional rule proves the program.