CS3234 Logic and Formal Systems

Assignment 07:
Program Verification

Submission on A-4 paper (use as many sheets as you want), to the office COM2, 03-51 (under the door, if necessary). Staple or tie your sheets together and write your name and matriculation number on the top of the front page.
Latest submission: Friday, 5/11, 5:00pm.

A proper proof in the proof calculus annotates every line with the name of the rule applied to derive that line. In your solutions to the following questions, indicate clearly what *invariant* and *variant* you are using.

1. (4 marks) Consider the following program `plusabs` in the programming language presented in the lectures:

   ```
   if (b > 0) {
      c = a + b;
   } else {
      c = a - b;
   }
   ```

   Give a proof for the following Hoare triple.

   $$\vdash_{\texttt{par}} \ \{\ \top\ \}\ \texttt{plusabs}\ \{\ c = a + |b|\ \}$$

   Solution

   $$\begin{array}{rl} & \{\top\} \\ \{a + |b| = a + |b| & \text{consequence}\} \end{array}$$

   ```
   if (b > 0) {
   ```

   $$\begin{array}{rl} & \{a + |b| = a + |b| \wedge b > 0 \quad \text{if}\} \\ \{a + b = a + |b| & \text{consequence}\} \\ \{[c \mapsto a + b]c = a + |b| & \text{definition of update}\} \end{array}$$