Task 1

Name _____

Non-deterministic while program

Annotate and prove the correctness of program **S** provided the following specification is given:

$$\{x = 0 \land n > 0\} \ S \ \{z = n\}$$

```
S ≡
y, x, z := n, 0, 0;
*( x = 0 ∧ y > 0 → z := z + 1; x := 1
     □
   x ≠ 0 ∧ y > 0 → y := y − 1; x := 0)
```

Hint: use z+y-x = n as one conjunct of the invariant

Task 2

Name _____

Shared variable parallel programs (interference test)

Specify assertions for interference test of the program specification

$$P_1 \equiv \{x \le 4 \wedge y = 2\}$$
$$S_1\colon \langle\, x \ge 2 \rightarrow y := y - 2\,\rangle$$
$$Q_1 \equiv \{y \le x \wedge x \ge 0\}$$
$$\|$$
$$P_2 \equiv \{x \ge 0 \wedge y \ge 0\}$$
$$S_2\colon \langle\, x = 4 \wedge y = 1 \rightarrow z := x - 3\,\rangle$$
$$Q_2 \equiv \{\, y + 2 \le x \,\}$$

Task 3

Name _____

Parallel programs with message passing (cooperation test).
Specify assertions for cooperation test.

$P_1 \equiv \{x = 5 \wedge y = 7\}$
$\quad S_1 : \langle\, E!\ y - 2\,\rangle;\ \langle\, x := y - 1\,\rangle\ \{x = 6 \wedge y = 7\};\ \langle\, C!\ x{+}5\,\rangle$
$Q_1 \equiv \{y < 9 \wedge x > 0\}$
$\qquad \|$
$P_2 \equiv \{u = 0\}$
$\quad S_2 : \langle\, E?\ u\,\rangle;\ \{u < 10\}\langle\, C?\ u\,\rangle$
$Q_2 \equiv \{u > 9\}$