1. Prove if  $x, y \in \mathbb{R}$  are positive then  $\sqrt{x+y} \neq \sqrt{x} + \sqrt{y}$ .

2. Prove that there is no positive integer n satisfying  $2n < n^2 < 3n$ .

- 3. Two of the following are false and one is true. Prove the true one by contradiction and provide counterexamples for the false ones.
  - (a) If  $n^2 + 3n$  is even then n is odd.
  - (b) If  $a \ge 2$  and b are integers then  $a \nmid b$  or  $a \nmid (b+1)$ .
  - (c) If  $A \not\subseteq B$  then  $A \cap B = \emptyset$ .