1. Determine if the following are True or False. Briefly explain why.
   a. \( \forall x \in \mathbb{R} \ \exists y \in \mathbb{R} \ \ x^2 = y \)
   b. \( \exists y \in \mathbb{R} \ \forall x \in \mathbb{R} \ \ x^2 = y \)
   c. \( \forall y \in \mathbb{R} \ \exists x \in \mathbb{R} \ \ x^2 = y \)

2. Write the parts in boxes using symbolic notation \( \forall \) and \( \exists \)
   a. \( \text{Let } A \subseteq \mathbb{R} \) \( A \) is a bounded set (Definition: \( A \) is bounded if it has an upper bound and a lower bound)
   b. \( f(x) = 0 \) has a unique solution. (This tells both that a solution exists and there are no other solutions. Hint: (4) in page 85)
   c. Let \( \alpha, \beta \) be solutions to \( \cos(5x) = 0 \) Then \( \alpha \) and \( \beta \) differ by a multiple of \( \pi/5 \). (Hint: \( \alpha - \beta = k \cdot \pi/5 \) need quantifier and constraint on \( k \))

3. Find the negation of: \( \forall x \in S \ \exists y \in \mathbb{R} \ \ p(x, y) \Rightarrow q(x, y) \)

4. Show in details \( \forall x \in \mathbb{R}^+ \ \exists m \in \mathbb{Z}^+ \ \forall n \in \mathbb{N} \) \( n > m \Rightarrow \left| \frac{3n^2 + 7}{n^2} - 3 \right| < \varepsilon \)