1. [30 points]
Determine whether the following statements are True or False.

\[ \{a, b\} \subseteq 2^{\{a, b\}} \quad T \quad F \]
\[ \{a, b, \{a, b\}\} - \{a, b\} = \{a, b\} \quad T \quad F \]
\[ \emptyset \in \emptyset \quad T \quad F \]

2. [30 points]
Define a binary relation \( P \) from \( \mathbb{R} \) to \( \mathbb{R} \) as follows:
\[ P = \{(x, y)|x \in \mathbb{R}, y \in \mathbb{R}, x = y^2\} \]
Is \( P \) a function? Motivate your answer.

3. [40 points]
Is \( (p \land q) \lor r \equiv p \land (q \lor r) \) a valid equivalence? Use truth tables to motivate your answer.