QUIZ 3.3

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MATH 3305  MATHEMATICAL REASONING

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1. Give the commutative, associative, and idempotent laws for intersection.

They are \( A \cap B = B \cap A \), \( (A \cap B) \cap C = A \cap (B \cap C) \), and \( A \cap A = A \), resp.

2. Fill in the blank: It is possible to prove statements about sets by using the Boolean laws for sets directly, without invoking a pick-a-point proof. Such proofs are called algebraic proofs.

3. (Example 7) Prove that \( (A - D) \cup (B - D) = (A \cup B) - D \).

(See text, p. 99, for solution.)

4. (Practice Problem 7) Supply a reason for each of the steps in Example 7.

(See text, p.114, for solution.)

5. (EXERCISE SET 3.3, Exercise 12(a).) Prove that \( (A \cap B) \cup (A - B) = A \) with a pick-a-point method.

Proof

\( \subseteq \) Let \( x \in (A \cap B) \cup (A - B) \). Then \( x \in A \cap B \), or \( x \in A - B \). Since both \( A \cap B \) and \( A - B \) are subsets of \( A \) by S12b, \( x \in A \).

\( \supseteq \) Let \( x \in A \). If \( x \in B \) also, then \( x \in A \cap B \subseteq (A \cap B) \cup (A - B) \). On the other hand, if \( x \notin B \), then, since \( x \in A \), \( x \in A - B \subseteq (A \cap B) \cup (A - B) \). In either case, \( x \in (A \cap B) \cup (A - B) \).