Math 265
YOUR NAME HERE
March 13, 2026

Homework # 9

Problem List Ch 9 # 5,6,8,10,16,21,23,28,29,34

Problem Directions: Prove or disprove.

5. If A, B, C and D are sets, then $(A \times B) \cup (C \times D) = (A \cup C) \times (B \cup D)$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

6. If A, B, C and D are sets, then $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

8. If A, B and C are sets, then $A - (B \cup C) = (A - B) \cup (A - C)$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

10. If A and B are sets and $A \cap B = \emptyset$, then $\mathscr{P}(A) - \mathscr{P}(B) \subseteq \mathscr{P}(A - B)$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

16. If A and B are finite sets, then $|A \cup B| = |A| + |B|$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

21. There exist prime numbers p and q for which $p - q = 97$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

23. If $x, y \in \mathbb{R}$ and $x^3 < y^3$, then $x < y$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

28. Suppose $a, b \in \mathbb{Z}$. If $a \mid b$ and $b \mid a$, then $a = b$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

29. If $x, y \in \mathbb{R}$ and $|x + y| = |x - y|$, then $y = 0$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

34. If $X \subseteq A \cup B$, then $X \subseteq A$ or $X \subseteq B$.

Proof. YOUR PROOF HERE. □

Your thoughts/concerns/questions here.

Selected Hints

Here are the truth values: 5. F, 6. T, 8. F, 10. T, 16. F, 21. F, 23. T, 28. F, 29. F, 34. F

21. Use what you know about *parity* of integer sums and of prime numbers.

23. I found it useful to remember $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$. Also, this can be proved directly OR by contrapositive. But either way, my argument required cases.