For all proofs, follow the in-class style as closely as possible.

Exercise 1.1. Prove that union is *commutative*: $A \cup B = B \cup A$.

Exercise 1.2. Prove that intersection is *associative*: $A \cap (B \cap C) = (A \cap B) \cap C$.

Exercise 1.3. Prove that union *distributes* over intersection: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

Exercise 1.4. Prove the second of DeMorgan's laws: $A \setminus (B \cap C) = (A \setminus B) \cup (A \setminus C)$.

Exercise 1.5. What is the maximum possible number of sets that can be formed with the operations union, intersection, and set-theoretic difference when starting with three sets A, B, and C? Justify your answer.