Theorem 2.2.1 page 81:

(j) $\emptyset - A = \emptyset$

proof: Suppose on the contrary that $x \in \emptyset - A$, then $\underline{x \in \emptyset}$, and $x \notin A$ this is a contradiction $\therefore$ $\emptyset - A = \emptyset$ ■

(q) If $A \subseteq B$, then $A \cup C \subseteq B \cup C$.

proof: Suppose $x \in A \cup C$, then $x \in A$ or $x \in C$, since $A \subseteq B$, then $x \in B$ or $x \in C$

so $x \in B \cup C$ ■.

Theorem 2.2.2 page 83:

(g) $(A \cap B)^c = A^c \cup B^c$

$x \in (A \cap B)^c$ iff $x \notin A \cap B$

iff $x \notin A$ or $x \notin B$

iff $x \in A^c$ or $x \in B^c$

iff $x \in A^c \cup B^c$

Theorem 2.2.3 page 85:

(f) $(A \times B) \cap (B \times A) = (A \cap B) \times (A \cap B)$

proof:

$(x, y) \in (A \times B) \cap (B \times A)$ iff $(x, y) \in A \times B$, and $(x, y) \in B \times A$

iff $x \in A$, $y \in B$, and $x \in B$, $y \in A$

iff $x \in A \cap B$, and $y \in A \cap B$

iff $(x, y) \in (A \cap B) \times (A \cap B)$