Sets Ex 1.7 Q1

To show $A' - B' = B - A$

We show that $A' - B' \subseteq B - A$ and vice versa

Let, $x \in A' - B'$

$\Rightarrow \quad x \in A'$ and $x \notin B'$

$\Rightarrow \quad x \notin A$ and $x \in B \qquad [\because A \cap A' = \phi$ and $B \cap B' = \phi]$

$\Rightarrow \quad x \in B$ and $x \notin A$

$\Rightarrow \quad x \in B - A$

This is true for all $x \in A' - B'$

Hence $A' - B' \subseteq B - A$

Conversely,

Let, $x \in B - A$

$\Rightarrow \quad x \in B$ and $x \notin A$

$\Rightarrow \quad x \notin B'$ and $x \in A' \qquad [\because B \cap B' = \phi$ and $A \cap A' = \phi]$

$\Rightarrow \quad x \in A'$ and $x \notin$ B'

$\Rightarrow \quad x \in A' - B'$

This is true for all $x \in B - A$

Hence $B - A \subseteq A' - B'$

$\therefore \ A' - B' = B - A \qquad$ Proved.

Sets Ex 1.7 Q2(i)

$$
\begin{aligned}
\text{LHS} &= A \cap (A' \cup B) \\
&= (A \cap A') \cup (A \cap B) && [\because \cap \text{ distributes over (i)}] \\
&= \phi \cup (A \cap B) && [\because A \cap A' = \phi] \\
&= A \cap B && [\because \phi \cup x = x \text{ for any set } x] \\
&= \text{RHS}
\end{aligned}
$$

$\therefore$ LHS = RHS Proved.

Sets Ex 1.7 Q2(ii)

For any sets A and B we have by De-morgan's laws

$$(A \cup B)' = A' \cap B', \quad (A \cap B)' = A' \cup B'$$

Also,

$$
\begin{aligned}
\text{LHS} &= A - (A - B) \\
&= A \cap (A - B)' \\
&= A \cap (A \cap B')' \\
&= A \cap (A' \cup (B')') && [\text{By De-morgan's law}] \\
&= A \cap (A' \cup B) && [\because (B')' = B] \\
&= (A \cap A') \cup (A \cap B) \\
&= \phi \cup (A \cap B) && [\because A \cap A' = \phi] \\
&= A \cap B && [\because \phi \cup x = x, \text{ for any set } x] \\
&= \text{RHS}
\end{aligned}
$$

$\therefore$ LHS = RHS Proved.

*********** END **********