1. Let U be a universal set and let A, B be subsets of U. Show that

$$(A \cup B)_U^C = A_U^C \cap B_U^C.$$

2. Let U be a universal set and A, B be its subsets. Show that

$$A \setminus B = A \cap B_U^C.$$

3. Let Λ be a non-empty indexing set and B_α a set for each $\alpha \in \Lambda$. Show that

$$A \setminus (\bigcup_{\alpha \in \Lambda} B_\alpha) = \bigcap_{\alpha \in \Lambda} (A \setminus B_\alpha).$$

4. Find $\mathcal{P}(\mathcal{P}(\{1\}))$ and $|\mathcal{P}(\mathcal{P}(\{1\}))|$.