$\Rightarrow (\{\alpha\}, \emptyset) \in \mathcal{P}(A) \times \mathcal{P}(B) \xRightarrow{f \to surj} (\exists\, x \in \mathcal{P}(T))\ \underset{(x \cap A,\, x \cap B)}{\overset{\parallel}{f(x)}} = (\{\alpha\}, \emptyset) \Rightarrow$

$\Leftrightarrow \begin{cases} x \cap A = \{\alpha\} \Rightarrow \alpha \in x \cap A \subseteq x \Rightarrow \left.\begin{matrix}\alpha \in x \\ \alpha \in B\end{matrix}\right\} \Rightarrow \alpha \in x \cap B = \emptyset \Rightarrow \\ x \cap B = \emptyset \end{cases}$

$\Rightarrow A \cap B = \emptyset$

'$\Leftarrow$' Fie $A_1 \in \mathcal{P}(A)$, $B_1 \in \mathcal{P}(B) \Rightarrow A_1 \cup B_1 \subseteq A \cup B \subseteq T \cup T = T$

$f(A_1 \cup B_1) = ((A_1 \cup B_1) \cap A, (A_1 \cup B_1) \cap B) = (A_1, B_1) \Rightarrow f \to surj$

$(A_1 \cup B_1) \cap A = (\underset{A_1}{\overset{\subseteq A}{A_1}} \cap A) \cup \overset{\subseteq B \cap A = \emptyset}{(B_1 \cap A)} = A_1 \cup \emptyset = A_1$

(c) $f \to bij \Leftrightarrow \begin{cases} f \to inj \overset{(a)}{\Leftrightarrow} \boxed{A \cup B = T}\ (*) \\ \text{și} \\ f \to surj \overset{(b)}{\Leftrightarrow} A \cap B = \emptyset \Leftrightarrow \boxed{A \subseteq \overline{B}}\ (**) \end{cases}$

$(*) \Rightarrow \overline{B} = \underset{\subseteq T}{\overline{B} \cap T} \overset{(*)}{=} \overline{B} \cap (A \cup B) = (A \cap \overline{B}) \cup (B \cap \overline{B}) = A \cap \overline{B}$

$\Rightarrow \overline{B} \subseteq A \xrightarrow{(**)} A = \overline{B} \Rightarrow A \cup B = \overline{B} \cup B = A \cup B = T$

$f \to bij \Leftrightarrow A \subseteq \overline{B}$ și $A = \overline{B} \Leftrightarrow A = \overline{B} \Leftrightarrow \overline{A} = \overline{\overline{B}} \Leftrightarrow B = \overline{A}$

Distributivitatea

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

$\forall n \in \mathbb{N}^*\ A \cup (A_1 \cap A_2 \cap \dots \cap A_n) = (A \cup A_1) \cap \dots \cap (A \cup A_n)$