2b. * $A \subset B$ or $A \subset C \iff A \subset (B \cup C)$

$x \in B$ or $x \in C \iff x \in B \cup C$ Definition (true)

$\iff$ false

$\Leftarrow$ false $A = \{b, c\}$; $B = \{b\}$; $C = \{c\}$
$b \neq c$

$\overset{?}{\Rightarrow}$ true $B \subset B \cup C$
$C \subset B \cup C$

j. $A \subset C$ and $B \subset D \Rightarrow (A \times B) \subset (C \times D)$

Given $A \subset C$ and $B \subset D$.

Let $(x, y) \in A \times B$.

We want to show that $(x, y) \in C \times D$.

$(x,y) \in A \times B \Rightarrow x \in A$ & $y \in B$

$A \subset C \Rightarrow x \in C$; $B \subset D \Rightarrow y \in D$

$x \in C$ & $y \in D \Rightarrow (x,y) \in C \times D$

k. $A \subset C$ and $B \subset D \Leftarrow (A \times B) \subset (C \times D)$

l. $\Leftarrow$ w/ $A, B \neq \emptyset$

k. $A = \emptyset$; $B = \{b\}$; $C = D = \{c\}$; $b \neq c$

$A \times B = \emptyset \subset C \times D$

$A \subset C \quad \emptyset \subset C$

$B \not\subset D$

k. $A \subset C$ and $B \subset D \Leftarrow (A \times B) \subset (C \times D)$

l. $\Leftarrow$ w/ $A, B \neq \emptyset$

l. Given $(A \times B) \subset (C \times D)$

We want to show that $A \subset C$ and $B \subset D$.

Proof: Since $A, B \neq \emptyset$

$\exists\, a \in A$ and $b \in B$. $(a, b) \in A \times B$

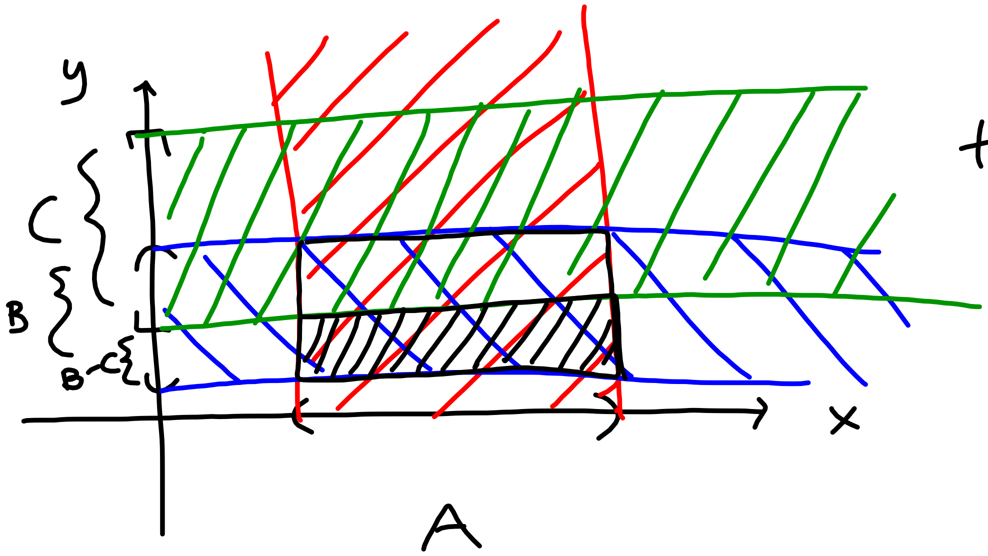
$(A \times B) \subset (C \times D) \Rightarrow (a, b) \in C \times D$

$\Rightarrow a \in C$ and $b \in D$

Since $a \in A \Rightarrow a \in C$, we have $A \subset C$

$b \in B \Rightarrow b \in D$, we have $B \subset D$. $\square$

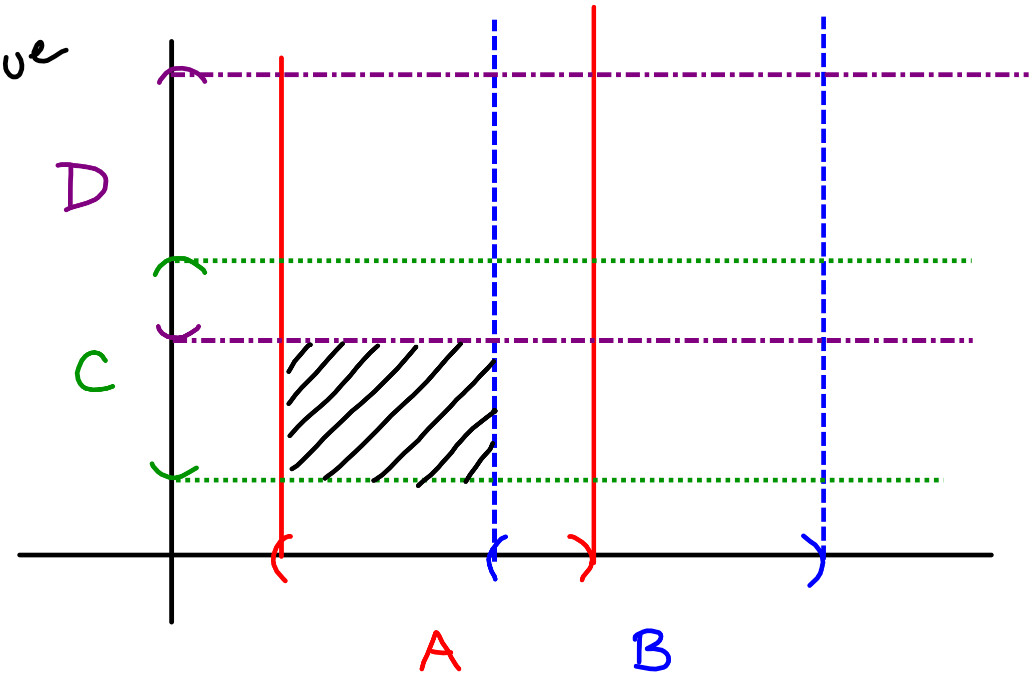
O. $A \times (B - C) = (A \times B) - (A \times C)$



true

P. $(A - B) \times (C - D) = (A \times C - B \times C) - A \times D$

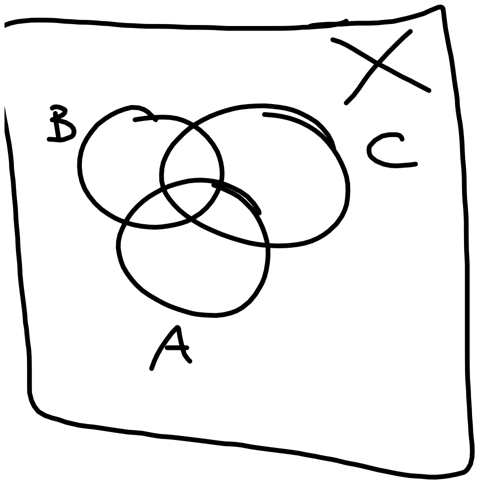
true



7. $F = \{x \mid x \in A \text{ and } (x \in B \Rightarrow x \in C)\}$

$= A \cap (\quad ? \quad)$

$\uparrow$



$\{x \mid \text{if } x \in B, \text{then } x \in C\}$

$x \in B \cap C \Rightarrow x \in B \Rightarrow x \in C$

$x \notin B \Rightarrow x \in X - B$

$A \cap ((B \cap C) \cup (X - B))$.