$prove\ that$

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

sol

$$(a,b) \in (A \times (B \cap C)) \Rightarrow a \in A \wedge b \in (B \cap C) \Rightarrow a \in A \wedge (b \in B \wedge b \in C)$$

$$\Rightarrow (a,b) \in A \times B \wedge (a,b) \in A \times C \Rightarrow (a,b) \in (A \times B) \cap (A \times C)$$

$$\Rightarrow A \times (B \cap C) \subseteq (A \times B) \cap (A \times C) \qquad (1)$$

$$(a,b) \in (A \times B) \cap (A \times C) \Rightarrow (a,b) \in (A \times B) \wedge (a,b) \in (A \times C)$$

$$\Rightarrow a \in A \wedge b \in B \wedge b \in C \Rightarrow a \in A \wedge b \in (B \cap C) \Rightarrow (a,b) \in A \times (B \cap C)$$

$$\Rightarrow (A \times B) \cap (A \times C) \subseteq A \times (B \cap C) \qquad (2)$$

$from\ (1)\ and\ (2)\ we\ get$

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

لاحظ ان

$$(A \times B) = \{(a,b): a \in A \wedge b \in B\}$$

مع تحيات د. فتحي انور عبدالحليم