Prove that  $A \cap B = A - (A - B)$ .

Solution: First we show that  $A \cap B \subseteq A - (A - B)$ . Let  $x \in A \cap B$ . Then  $x \in A$  and  $x \in B$ . By definition,  $x \notin (A - B)$ . However, since  $x \in A$  and  $x \notin (A - B)$ , we have that  $x \in A - (A - B)$ .

Next, we show that  $A - (A - B) \subseteq A \cap B$ . Let  $x \in A - (A - B)$ . By definition, this means that  $x \in A$  and  $x \notin (A - B)$ . For  $x \notin (A - B)$  to be true, either  $x \notin A$  (which we know is false) or  $x \in A$  and  $x \in B$ . Thus  $x \in A$  and  $x \in B$  and hence by definition,  $x \in A \cap B$ .

Therefore,  $A \cap B = A - (A - B)$