1. Prove De Morgan's Law

$(A \cup B)^c = A^c \cap B^c$

① If $x \in (A \cup B)^c$, then $x \notin A \cup B$

$\Rightarrow$ $x \notin A$ and $x \notin B$

$\Rightarrow$ $x \in A^c \cap B^c$

② If $x \in A^c \cap B^c$, assume $x \in A \cup B$

then $x \in A$ or $x \in B$

contradicts with $x \in A^c$ and $x \in B^c$

$\Rightarrow$ $x \in (A \cup B)^c$

2. If $B \subset A$ prove $P(A) = P(B) + P(A \cap B^c)$

proof: Since $B \subset A$, $A = B \cup (A \cap B^c)$

also $B \cap (A \cap B^c) = \phi$

using Axiom 3,

$P(A) = P[B \cup (A \cap B^c)] = P(B) + P(A \cap B^c)$