[nex75] **Borel space**

In general, probabilities cannot be assigned to all subsets of the sample space Ω. The Borel space is defined as the set of subsets of Ω for which the following properties hold:

(i) $\Omega \in \mathcal{B}$;

(ii) if $A \in \mathcal{B}$ then $\bar{A} \in \mathcal{B}$, where $\bar{A}$ is the complement of A;

(iii) if $A, B \in \mathcal{B}$ then $A \cup B \in \mathcal{B}$.

Given that the empty set $\emptyset$ is the complement of Ω, it is also an element of $\mathcal{B}$. Show that the following property follows from (i)-(iii):

(iv) if $A, B \in \mathcal{B}$ then $A \cap B \in \mathcal{B}$.