1. **Exercise 1.3**

   - If $A \in \mathcal{G}_1$ and is different from empty set and the whole set, then A^c is closed and and doe not belong to $\mathcal{G}_1$. Thus, $\mathcal{G}_1$ is not an algebra.
   - If $a = b$ then $\emptyset \in \mathcal{G}_2$. If $b \leq a$, then $\mathbb{R} \in \mathcal{G}_2$. Thus by definition of G_2, it is an algebra.
   - If $a = b$ then $\emptyset \in \mathcal{G}_2$. If $b \leq a$, then $\mathbb{R} \in \mathcal{G}_2$. Thus by definition of G_2, it is an $\sigma-$algebra.

2. **Exercise 1.7**

   - $\mathcal{A}$ is a $\sigma-$algebra. Thus, by definition it contains $\{\emptyset, X\}$
   - $\mathcal{A}$ is a $\sigma-$algebra. By definition it is a family of subsets of X, thus, $\mathcal{A} \subset \mathcal{P}(X)$.

3. **Exercise 1.10**

   - $\emptyset \in \mathcal{S}_\alpha \;\; \forall \alpha \;\; \Rightarrow \emptyset \in \cap_\alpha \mathcal{S}_\alpha$
   - If $A \in \cap_\alpha \mathcal{S}_\alpha$, then $A \in \mathcal{S}_\alpha$ and $A^c \in \mathcal{S}_\alpha \; \forall \alpha$, hence, $A^c \in \cap_\alpha \mathcal{S}_\alpha$
   - If $A_n \in \cap_\alpha \mathcal{S}_\alpha$, then then $A_n \in \mathcal{S}_\alpha$ and $\cup_n A_n \in \mathcal{S}_\alpha \; \forall \alpha$, hence, $\cap_n A_n \in \cup_\alpha \mathcal{S}_\alpha$

4. **Exercise 1.22**

   - $A \subset B \;\; \Rightarrow B = A \cup (B \cap A^c)$. Since A and $B \cap A^c$ are disjoint, $\mu(B) = \mu(A) + \mu(B \cap A^c)$. Thus, $\mu(A) \leq \mu(B)$.
   - $A = (A \cap B^c) \cup (A \cap B)$ and $B = (B \cap A^c) \cup (B \cap A)$. $\mu(A) + \mu(B) = \mu(A \cap B) + \mu(A \cap B) + \mu(A \cap B^c) + \mu(A^c \cap B) = \mu(A \cap B) + \mu(A \cup B)$. Thus, $\mu(A) + \mu(B) \geq \mu(A \cup B)$.

5. **Exercise 1.23**

   - $\lambda(\emptyset) = \mu(\emptyset \cap B) = \mu(\emptyset) = 0$.
   - $\lambda(\cup_n \mathcal{A}_n) = \mu((\cup_n \mathcal{A}_n) \cap B) = \mu(\cup_n (\mathcal{A}_n \cap B)) = \sum_n \mu(\mathcal{A}_n \cap B) = \sum_n \lambda(\mathcal{A}_n)$. ($\{\mathcal{A}_n\}$ disjoint $\rightarrow \{\mathcal{A}_n \cap B\}$ disjoint.)

6. **Exercise 1.26**

   - $\mu(\cap_n \mathcal{A}_n) = \mu((\cup_n \mathcal{A}_n^c)^c) = \mu(X) - \mu(\cup_n \mathcal{A}_n^c) = \mu(X) - \lim_{n \to \infty} \mu(\mathcal{A}_n^c) = \mu(X) - \lim_{n \to \infty}(\mu(X) - \mu(\mathcal{A}_n)) = \lim_{n \to \infty} \mu(\mathcal{A}_n)$. By (i).