1. [Mason] Suppose $f \in \mathcal{R}[a,b]$ and $\alpha \in \mathbb{R}$. Show that $\alpha f \in \mathcal{R}[a,b]$ and

$$\int_a^b \alpha f = \alpha \int_a^b f$$

2. [Sakti] Show that the uniform limit of Riemann integrable functions is Riemann integrable. Conclude that $\mathcal{R}[a,b]$ is a closed subset of $B[a,b]$.

3. [Max] Find (with proof) an element of $\mathcal{R}[a,b]$ that is not a uniform limit of step functions.

4. [Jody] Show that integration on $\mathcal{R}[a,b]$ (as a closed subset of $B[a,b]$ is continuous by showing that the map

$$f \mapsto \int_a^b f$$

is a bounded linear map.

5. [Lander] Determine if $\chi_\Delta \in \mathcal{R}[0,1]$, where Δ is the Cantor set.

6. [Jody] Suppose $l : \mathcal{P}(\mathbb{R}) \to [0,\infty]$ and that it is either additive or that it is countably additive. Show that either $l(\varnothing) = 0$ or $l(A) = \infty$ for all $A \in \mathcal{P}(\mathbb{R})$. Regardless, show that l is monotone.

7. [Mason] Suppose $l : \mathcal{P}(\mathbb{R}) \to [0,\infty]$. Show that l is countably additive if and only if l is finitely additive and countably subadditive.