1. Show that
$$\mathbb{Q}[\sqrt{2}] := \{a + b\sqrt{2} : a, b \in \mathbb{Q}\}$$
is a field.

2. (addition to problem 4) Explain why it follows immediately from problem 4 that if $a, b \in \mathbb{F}$ and $a \cdot b = 0$, then either $a = 0$ or $b = 0$.