**Q1** Let $K/F$ be a field extension. Show that if $\alpha \in K$ is a root of $f(x) \in F[x]$ and $\deg f(x) = [F(\alpha) : F]$, then $f(x)$ is irreducible in $F[x]$.

**Q2** §13.2 Problem 13.

**Q3** §13.2 Problem 16.

**Q4** §13.4 Problem 1.

**Q5** Show that $\mathbb{Q}(\sqrt{3}, \sqrt{-1})$ is a splitting field of $x^{12} - 1 \in \mathbb{Q}[x]$ and $[\mathbb{Q}(\sqrt{3}, \sqrt{-1}) : \mathbb{Q}] = 4$.