

A Book of Abstract Algebra | (2nd Edition)

Chapter 32, Problem 1EA

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Problem

Show that $\mathbb{Q}(i, \sqrt{2})$ is the root field of $(x^2 + 1)(x^2 - 2)$ over \mathbb{Q} .

Step-by-step solution

Step 1 of 2

The objective is to show that $\mathbb{Q}(i, \sqrt{2})$ is the root field of $(x^2 + 1)(x^2 - 2)$ over \mathbb{Q} .

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Step 2 of 2

The polynomial $f(x) = (x^2 + 1)(x^2 - 2)$ has roots $\{i, -i, \sqrt{2}, -\sqrt{2}\}$.

Since $\mathbb{Q}(i, \sqrt{2})$ contains the roots of $f(x) = (x^2 + 1)(x^2 - 2)$, $\mathbb{Q}(i, \sqrt{2})$ is the root field of $(x^2 + 1)(x^2 - 2)$ over \mathbb{Q} .

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