

A Book of Abstract Algebra | (2nd Edition)

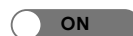


Chapter 30, Problem 3EG



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Problem

Prove each of the following:

\mathbb{D} is the smallest field extension of \mathbb{Q} closed with respect to square roots of positive numbers (that is, any field extension of \mathbb{Q} closed with respect to square roots contains \mathbb{D}). (Use part 2 and Exercise A.)

Step-by-step solution

Step 1 of 3

Here, objective is to prove that \mathbb{D} is the smallest field extension of \mathbb{Q} closed with respect to square roots of positive numbers.

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Step 2 of 3

B is field extension of A : It is a pair of fields, that the operations of A are those of B are restricted

to A . So A is a subfield of B .

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Step 3 of 3

Consider D is a field closed with respect to taking square roots of positive numbers.

D is called as field of constructible numbers.

if $a \in D$,
then $\sqrt{a} \in D$

Q is the set of rational numbers only. D is the set of real numbers.

Therefore,

$$Q \subseteq D$$

Q is subfield of D .

Therefore,

D is the smallest field extension of Q closed with respect to square roots of positive numbers.

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