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Chapter 30, Problem 2EG   Bookmark   Show all steps: **ON**

Problem

Prove each of the following:

Any constructible number can be obtained from rational numbers by repeated addition, subtraction, multiplication, division, and taking square roots of positive numbers.

Step-by-step solution

Step 1 of 3

Here, objective is to prove that any constructible number can be obtained from rational numbers by repeated addition, subtraction, multiplication, division and square toots of positives.

Comment

Step 2 of 3

Constructible point:

A point is said to be constructible, if it is either the end point of a given line segment or intersection of lines which are determined by previously obtained constructible points.

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Step 3 of 3

Constructible number is a coordinate of a constructible point.

Let p is a constructible point then say n number of points $p = p_1, p_2, ...p_n$

So,

The point p is constructible from $p_1, p_2, ...p_n$ by using arithmetic operations such as addition, subtraction, multiplication and square roots. Coordinates of point p are obtained by starting with rational numbers and then applying these operations.

So such type of numbers correspond to line segments, they can be constructed using only straight edge and compass.

Therefore,

any constructible number can be obtained from rational numbers by repeated addition, subtraction, multiplication, division and square roots of positives.

Hence, proved.

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