

Quaternions and Rotations of \mathfrak{R}^3 .

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Abstract

Can one make sense of $1 + (0, 0, 1)$ or $1/(-2, 3, 5)$? What is the result of the rotation of \mathfrak{R}^3 on 180 degrees counterclockwise around $i + j + k$, and then on the same angle around i ? Answers to these and other interesting questions is provided by quaternions, the one and only noncommutative associative division algebra over \mathfrak{R} , discovered by the Irish mathematician Sir William Rowan Hamilton in 1843. Quaternions and the nonassociative extension of quaternions, known as octonions, found some applications in physics and appeared in a couple of talks in this seminar before. We will consider the definition, basic properties and some applications of quaternions.