ÇANKAYA UNIVERSITY

Department of Mathematics

SEMINAR

The Algebra of Rotations: From Complex Numbers to Octonions

Speaker: Neslihan Ayşen ÖZBAY

Date: 14.05.2026

Time: 10:20

Place: RA-03

Abstract: In this talk, we will explore how math helps us rotate objects in space. We start with complex numbers in 2D. We will see how the number i turns everything by 90 degrees. This happens because two 90-degree turns make a 180-degree flip, which is the same as multiplying by -1. The main part of our talk is about the move to 3D. In 1843, William Rowan Hamilton discovered that 3D numbers weren't enough to make rotations. Instead, he needed 4D numbers called quaternions. We will explain this using the "stabbing pen" idea: to rotate an object, you need 3 numbers for the direction of the pen (the axis) and 1 number for how much you turn it (the angle). Finally, we will visit the world of octonions (8D numbers). We will see a strange truth about math: as we add more dimensions, we lose some simple rules. By the time we reach 16 dimensions, the math becomes too messy to use. This shows us that even in math, there are limits to how far we can go.