

Scuola tematica "Modern Trends in Pure and Applied Mathematics"



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A. Sorrentino (University of Roma Tor Vergata) - Minicourse "When Mathematicians play... billiards"

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Abstract

Mathematical billiards offer a rich and fascinating playground where geometry, dynamics, and analysis theory meet. In its simplest form, a billiard system consists of a point particle moving freely within a domain, undergoing elastic reflections off the boundary according to the classical law of reflection. Despite the apparent simplicity of the model, the resulting dynamics are deeply intricate and sensitive to the geometry of the domain.

This mini-course will provide an introduction to the mathematical study of billiard systems, with a focus on smooth strictly convex planar domains (also known as Birkhoff Billiards). Topics will include: periodic orbits, invariant curves, and caustics, as well as classical results concerning integrable billiards. Time permitting, we will also briefly discuss related billiard-like models, such as outer billiards, symplectic billiards, or billiards on surfaces of constant curvature, highlighting their similarities and key differences from the classical ones.