

Scattering, Resonances, and Wave Equations

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1 Abstract

Scattering theory is a field of physics which attempts to answer the age-old question of what happens when things hit other things. Slightly more specifically, we will consider the behavior of a wave when it encounters a potential which threatens to affect its amplitude (and, more sinisterly, its energy). Motivated by this example, we will introduce a fundamental object in scattering theory, namely scattering resonances, and discuss resonance expansions. A resonance expansion is the analogue of a Fourier series for unbounded domains, where the escape of energy to infinity leads to exponential decay. Here, resonances play the role of the eigenvalues, and they arise from the meromorphic continuation of an operator-valued function called the resolvent. We will observe a survey of results for potential scattering in 3D, with the hopes that it will serve as motivation to delve deeper into the subject.