Negative results in enumerative combinatorics

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When we cannot solve an enumeration problem, we wonder whether we are just missing an easy solution or the problem is indeed difficult. In this talk, we will survey some recent methods that can prove that the generating function of some combinatorially defined sequences is *not* rational or *not algebraic*.

As an application, we will show that the generating function for the number of permutations avoiding a given pattern q is almost never rational. In some cases, we will show that that generating function is not even algebraic. We will also show that six classic families of algebraic generating functions will never be rational. We will conclude will some intriguing open problems.