

Abstract

Operator monotone functions: old and new

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This series of lectures starts with a short overview of the basic theory of operator monotone functions, and their close relatives the operator concave functions, starting with the celebrated results by Karl Lowner. The theory behind it requires a fair bit of complex analysis, but we chose to present only the main results here, and put more emphasis on applications. In the second part we delve into more recent developments, namely the beautiful theory of matrix means due to Kubo and Ando, which puts a large class of matrix means in a 1-to-1 correspondence with the operator monotone functions. In the third part we have a look at some of the very latest developments, including applications in statistical quantum physics, the theory of Sylvester equations, and more. A basic knowledge in functional analysis and linear algebra (at the undergraduate level) should suffice to make the most of the lectures.