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Title: Ando-Hiai type inequalities for operator means and operator perspectives

Abstract: When σ is an operator mean in the sense of Kubo-Ando and A, B > 0 are positive invertible operators, the Ando-Hiai inequality is typically stated as follows:

$$A\sigma B \le I \implies A^p \sigma B^p \le I \quad (p \ge 1),$$
$$A\sigma B \ge I \implies A^p \sigma B^p \ge I \quad (p \ge 1).$$

Since the first appearance in the case of weighted operator geometric means, Ando-Hiai type inequalities for operator means have been in active consideration, and have taken an important part in recent developments of multivariable operator means, in particular, of multivariable geometric means. We improve the existing Ando-Hiai inequalities for operator means and present new ones for operator perspectives in several ways. We also provide the operator perspective version of the Lie-Trotter formula and consider the extension problem of operator perspectives to non-invertible positive operators.

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