

Functional Analysis: Entering Hilbert Space - DTU Orbit (08/11/2017)

Functional Analysis: Entering Hilbert Space

In the second edition, I have expanded the material on normed vector spaces and their operators presented in Chapter 1 to include proofs of the Open Map-ping Theorem, the Closed Graph Theorem and the Hahn-Banach The orem.

The material on operators between normed vector spaces is further expanded in a new chapter on Fredholm theory (Chapter 6). Fredholm theory originates in pioneering work of the Swedish mathematician Erik Ivar Fred-holm on integral equations, which inspired the study of a new class of bounded linear operators, known as Fredholm operators. Chapter 6 presents the basic elements of the theory of Fredholm operators on general Banach spaces, not only on Hilbert spaces, since this is important for applications of the theory.

The more general setting with Banach spaces requires that we develop the theory of dual operators between Banach spaces to replace the use of adjoint operators between Hilbert spaces.

Fredholm operators are of interest far beyond mathematical analysis, they also play a significant role in theoretical physics, differential geometry and topology with the famous Index Theorem proved by Michael Atiyah and Isadore Singer in 1963 as a highlight.

With the addition of the new material on normed vector spaces and their operators, the book can hopefully serve as a general introduction to functional analysis viewed as a theory of infinite dimensional linear spaces and linear operators acting on them.

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