On Gleason–Kahane–Zelazko Theorems

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Let $T : H^p \to H^p$ be a linear mapping (no continuity assumption). What can we say about T if we assume that "it preserves outer functions"? Another related question is to consider linear functionals $T : H^p \to \mathbb{C}$ (again, no continuity assumption) and ask about those functionals whose kernels do not include any outer function. We study such questions via an abstract result which can be interpreted as the generalized Gleason–Kahane–Żelazko theorem for modules. In particular, we see that continuity of endomorphisms and functionals is a part of the conclusion. We go further and also discuss GKZ in other function spaces, e.g., Bergman, Dirichlet, Besov, the little Bloch, and VMOA and even generally in RKHS.

This is a joint work with T. Ransford.

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