Multipliers and Integration operators on Dirichlet spaces

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Abstract

Let $D = \{|z| < 1\}$ be the unit disk of the complex plane and $g : D \to \mathbb{C}$ an analytic function. We study the action of the following operators

$$I_g(f)(z) = \int_0^z f'(\zeta)g(\zeta)\, d\zeta$$
$$J_g(f)(z) = \int_0^z f(\zeta)g'(\zeta)\, d\zeta$$
$$M_g(f)(z) = f(z)g(z)$$

on the weighted Dirichlet spaces D^p_α, $(p > 0\,, \alpha > -1)$. These spaces contain the analytic functions $f : D \to \mathbb{C}$ such that

$$\|f\|^p_{D^p_\alpha} = |f(0)|^p + \int_{\mathbb{D}} |f'(z)|^p (1 - |z|^2)^\alpha\, dA(z) < \infty\ .$$

We also consider the closely related question of characterizing the Carleson measures for the spaces D^p_α.