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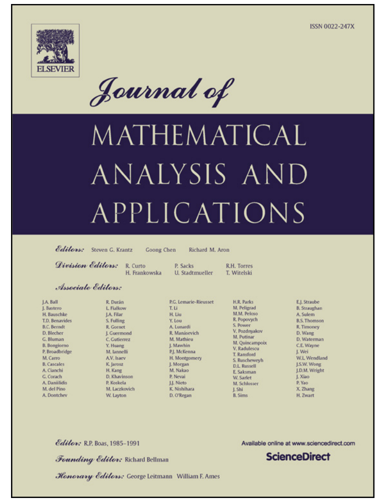

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DIFFERENCE OF COMPOSITION OPERATORS BETWEEN DIFFERENT HARDY SPACES

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ABSTRACT. Some estimates for the norm and essential norm of the difference of two composition operators between different Hardy spaces are given in this paper.

Keywords: Hardy space, composition operator, difference, norm, essential norm.

1. INTRODUCTION

Let $\mathbb{D}$ denote the open unit disk of the complex plane $\mathbb{C}$. We denote the closure and the unit circle of $\mathbb{D}$ by $\overline{\mathbb{D}}$ and $\partial\mathbb{D}$, respectively. For $a \in \mathbb{D}$, let $\sigma_a(z) := \frac{a-z}{1-\bar{a}z}$ be the disc automorphism that exchanges 0 for a. Let $\triangle(a,r) := \{z \in \mathbb{D} : |\sigma_a(z)| < r\}$ denote the pseudohyperbolic disk centered at a with radius r. For two points z, $w \in \mathbb{D}$, the pseudohyperbolic distance is given by

$$\rho(z,w) = |\sigma_w(z)| = \Big|\frac{z-w}{1-\bar{w}z}\Big|.$$

Let $H(\mathbb{D})$ denote the class of functions analytic in $\mathbb{D}$. Let $dm = \frac{d\theta}{2\pi}$ denote the normalized Lebesgue measure on $\partial\mathbb{D}$. The Lebesgue space $L^p(m)$ will also be denoted by $L^p(\partial\mathbb{D})$, $0 < p < \infty$. For $0 < p < \infty$, let H^p denote the Hardy space of all $f \in H(\mathbb{D})$ such that

$$\|f\|_p^p = \sup_{0<r<1} \int_{\partial\mathbb{D}} |f(r\xi)|^p dm(\xi) < \infty.$$

Recall that if $f \in H^p(\mathbb{D})$, then the radial limits $\lim_{r\to 1} f(re^{i\theta})$ exists almost everywhere on $\partial\mathbb{D}$ and will be denoted also by f, which belongs to $L^p(\partial\mathbb{D})$ and

$$\|f\|_p^p = \frac{1}{2\pi}\int_0^{2\pi} |f(e^{i\theta})|^p d\theta.$$

The space $H^\infty(\mathbb{D})$ consists of all bounded analytic functions on $\mathbb{D}$, and its norm is given by the supremum norm on $\mathbb{D}$.

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