1125-47-1282 **William M. Higdon*** (wmhigdon@butler.edu), Department of Mathematics and Statistics, 4600 Sunset Avenue, Indianapolis, IN 46208. *On The Numerical Ranges of Composition Operators Induced By Mappings With The Denjoy-Wolff Point On The Boundary.*

The *numerical range* of an operator T on a Hilbert space H, denoted $W(T)$, is the set,

$$W(T) = \{ < Tx, x > \ | \ x \in H \text{ and } \|x\| = 1\}.$$

Elementary properties of $W(T)$ include that it is a bounded subset of $\mathbf{C}$, it is convex, it contains the eigenvalues of T, and, more generally, its closure includes the spectrum of T. The work presented here answers the question posed by Professors Paul S. Bourdon and Joel H. Shapiro in their paper ("When Is Zero In The Numerical Range Of A Composition Operator?", J. IEOT., 44 (2002), 410-441):

"Suppose the symbol ϕ of the composition operator C_ϕ on $H^2(D)$ is univalent, not linear fractional, and is of parabolic nonautomorphism type. Is $0 \in W(C_\phi)$?"

The answer has been, in general, unknown. One property of such a mapping is that it has derivative equal to 1 at its Denjoy-Wolff point (boundary fixed point). Using elementary properties of C_ϕ-invariant subspaces, the answer to the question is demonstrated. Together with the work of Bourdon and Shapiro, this provides a complete description of when 0 belongs to the numerical range of a composition operator C_ϕ on $H^2(D)$. (Received September 15, 2016)