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TWIST PERIODIC ORBITS AND TOPOLOGICAL ENTROPY FOR CONTINUOUS MAPS OF THE CIRCLE OF DEGREE ONE WHICH HAVE A FIXED POINT(*)

by

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Let S^1 be the circle. We denote by $C_1(S^1)$ *the set of all continuous maps from S^1 to itself of degree one.* For $x \in S^1$, we say that x is periodic if there exists a positive integer n such that $f^n(x) = x$. The period of x is the smallest integer satisfying this relation. Let P(f) be the set of periods of f. If $x \in S^1$ is a periodic point of period n, then the orbit of x is the set $\{f^k(x): k=1,2,\ldots,n\}$. We refer to such an orbit as a periodic orbit of period n.

Let $f \in C_1(S^1)$, F its lifting to the covering space $\mathbb{R}$ and $e(X) = \exp(2\pi iX)$ the natural projection of $\mathbb{R} \longrightarrow S^1$. We note that F is not defined uniquely; nevertheless, if F and F' are two liftings of f then $F = F'+m$ with $m \in \mathbb{Z}$. Since $\deg(f) = 1$ we have $F(X + 1) = F(X) + 1$ for all $X \in \mathbb{R}$. If x is a periodic point of f of period n and $e(X) = x$, then $F^n(X) = X+ k$ where $k \in \mathbb{Z}$. We shall call k/n the *rotation number* (or F-rotation number, if necessary) of x and we denote it by $\rho(x)$ or $\rho_F(x)$. We denote by L(f) or $L_F(f)$ the set of all rotation numbers of f.

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