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Some Results in Dynamics of the Positive Characteristic Tori

The positive characteristic tori T_F are a set of counterparts to the real torus $T = \mathbb{R}/\mathbb{Z}$. In positive characteristic we define the "integers" as polynomials with coefficients from a finite field F ($Z_F := F[t]$) and the "reals" as the field of Laurent series with coefficients in F ($R_F := F((t))$) so that the positive characteristic torus over F is similarly defined: $T_F := R_F/Z_F$. While T and T_F have some structural and operational similarities, they behave fundamentally differently, particularly with regards to dynamics. In particular, we find that Furstenberg's orbital density theorem falls apart in positive characteristic, and establish that the intersection of orbits of affine maps rely on sets that depend on powers of the characteristic of F rather than arithmetic progressions. At first glance, the simplicity of working in T_F and its similarities to T suggest that we should be able to find many of the same simple results; however in reality the structure of T_F consists of infinitely defined sub-structures constructed by shifts of Frobenius maps into itself and these sub-structures present themselves frequently in a manner that does not occur in T .