

# A RENORMALIZED RIEMANN-ROCH FORMULA AND THE THOM ISOMORPHISM FOR THE FREE LOOP SPACE

MATTHEW ANDO AND JACK MORAVA AND JACK MORAVA

ABSTRACT. We show that the fixed-point formula in an equivariant complex-oriented cohomology theory  $E$ , applied to the free loop space of a manifold  $X$ , defines a (renormalized) Riemann-Roch formula for the quotient of the group law of  $E$  by a free cyclic subgroup. If  $E$  is  $K$ -theory, this explains how the elliptic genus associated to the Tate elliptic curve emerges from Witten's analysis of the fixed-point formula in  $K$ -theory. [In general this quotient is not representable, but by using the theory of  $p$ -divisible groups, we show that its torsion subgroup is.] The equivariant Borel extensions of the cohomology theories associated to Lubin-Tate lifts provide a large class of new examples.

For a general equivariant  $E$ , we show that the formal Weierstrass products defined by these quotients have a natural interpretation as Thom classes for prospectra similar to those considered by Cohen, Jones, and Segal. These prospectra seem to define interesting models for the physicists' space of 'small' loops on a manifold.

[For some earlier work along these lines, see Ando, Morava, and Sadofsky in *Geometry and Topology* 2 (1998).]

DEPARTMENT OF MATHEMATICS, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

DEPARTMENT OF MATHEMATICS, THE JOHNS HOPKINS UNIVERSITY