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A UNIVERSAL FORMAL GROUP AND COMPLEX COBORDISM

BY MICHIEL HAZEWINKEL[1]

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The purpose of this note is to 'announce' some of the results of [5], [6], [7] pertaining to formal groups and complex cobordism. These should have been written up a number of years ago. The phrase "formal group" is used as an abbreviation for commutative one-dimensional formal group (law).

1. **Introduction.** Below we give an explicit recursion formula for the logarithm of a universal commutative formal group and a p-typically universal commutative formal group. These give us a universal formal group F_U defined over $\mathbf{Z}[U] = \mathbf{Z}[U_2, U_3, U_4, \ldots]$ and a p-typically universal formal group F_T over $\mathbf{Z}[T_1, T_2, \ldots]$. Possibly the best way to look at these formal groups is as follows. To fix ideas let p be a fixed prime number and let A be a commutative ring with unit such that every prime number $\neq p$ is invertible in A. Let F_T be the one-dimensional p-typically universal formal group and G a one-dimensional formal group over A. Cartier [4] associates to G a module of curves $C(G)$ over a certain ring $\mathrm{Cart}_p(A)$. The ring $\mathrm{Cart}_p(A)$ has as its elements expressions $\Sigma\, V^i[a_{ij}]\,\mathbf{f}^j$, $a_{ij} \in A$, which are added and multiplied according to certain rules, cf. [4] and [9]; V stands for the 'Verschiebung' associated to the prime number p and $\mathbf{f}$ stands for the 'Frobenius' associated to the prime number p. The left modules C over $\mathrm{Cart}_p(A)$ which arise as modules of curves of some one-dimensional commutative formal group are of the form

$$C \simeq \mathrm{Cart}_p(A)\Big/\mathrm{Cart}_p(A)\left(\mathbf{f} - \sum_{i=1}^{\infty} V^i[t_i]\right), \qquad t_i \in A.$$

Now let F_t be the formal group over A obtained by substituting t_i for T_i. Then $C(F_t) = C$.

2. **The formulae.** Choose a prime number p and let

$$l_n(T) = \sum T_{i_1} T_{i_2}^{p^{i_1}} \cdots T_{i_s}^{p^{i_1+\cdots+i_{s-1}}}/p^s \tag{2.1}$$

where the sum is over all sequences $(i_1, i_2, \ldots, i_s)$, $i_j \in \mathbf{N} = \{1, 2, 3, \ldots\}$ such that $i_1 + \cdots + i_s = n$.

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