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Stiefel-Whintey class of a category and its application

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In a purely combinatorial context, we define Euler integrals and Stiefel-Whitney classes for finite posets and finite categories. This is an elementary toy example of combinatorial counterpart of characteristic classes for real algebraic orbifolds. We have implemented software for computing those invariants.

For finite categories, we propose a reasonable definition of constructible functions, which is modeled on such functions on a simplicial complex associated to a triangulated orbifold; the combinatorial substitute is the poset EA of elements associated to a functor ΔA→ **Monoids**, and then we associate the group F(EA;R) of (R-valued) constructible functions on the order complex of EA. We then introduce the Stiefel-Whitney class w_*(A) (:= $w_*(11_{EA})$); it is defined as a natural transformation

$$w_* : F^{eu}(EA;Z_2) \to H_*(EA;Z_2)$$

between a subfunctor F^{eu} of F and the Z_2-homology functor H_*. It may be compared with the Chern-Schwartz-MacPherson classes for quasi-projective Deligne-Mumford stacks X valued in the Chow group, formulated as a variant of Grothendieck-Riemann-Roch $c_* : F(X;Z) \to CH_* (X;Z)$, defined by the third author in algebraic geometry.