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Cox rings and Combinatorics

Generalizing a construction of D. Cox for toric varieties, one may associate to any variety X with finitely generated free divisor class group $K := \mathrm{Cl}(X)$ a K-graded homogeneous coordinate ring, its "Cox ring" $R(X)$. We show that geometrical properties X can be described by suitable combinatorial data in X. We discuss applications to GIT and embeddings of homogeneous spaces.