

REVIEW OF THE CLASSICAL MCKAY CORRESPONDENCE BY MATOUS MENCIK

LIRAN SHAUL

The thesis under review discusses the theory of the McKay correspondence. The first chapter starts with some elementary group theory, where the finite subgroups of $SL_2(\mathbb{C})$ are classified up to conjugation. Afterwards, the basic theory of Dynkin diagrams is discussed thoroughly. Chapter two starts with some of the basic of finite dimensional non-modular representation theory of finite groups. In particular, the notion of a representation, and some of the basic facts and operations involving representations are explained. After this discussion, the McKay graph of a representation is defined, its basic properties are studied, and its relation to Dynkin diagrams is established. Chapter 3 starts with some basic affine algebraic geometry. The equivalence between affine algebraic sets and reduced finitely generated algebras over the complex numbers is discussed here. Then, some geometric invariant theory is discussed. Afterward, there seem to be a missing part in Definition 3.3.1 regarding singularities. Maybe the definition of a nonsingular variety? the general definition of a variety? in either case, it is clear that some discussion is missing here. After this omission, the basics of resolution of singularities using blow ups is discussed. Finally, the geometric McKay correspondence is briefly discussed, and applied to the cyclic group. For other groups, only a reference is given. Overall, this is a reasonable thesis, which discusses some advanced mathematics. It is unfortunate that it contains omissions, and the reviewer feels that Theorem 3.3.9 should have been discussed in more depth in cases other than the cyclic case, to demonstrate more understanding of the student. It is also not clear if any of what this thesis contains is original proofs, or (more likely) if it only contains proofs from other sources.